The Builder.

VOL. LVIII. No. 2456. SATURDAY, MARCH 1, 1890.

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The Report on the Glasgow Mill Disaster.

THE report on the causes of what has been known as the Templeton mill disaster at Glasgow, by Col. Malcolm and Mr. Robertson, the Commissioners appointed to inquire into the cause of the fall of the building and report thereon to her Majesty's Secretary for Scotland, is dated January 23 of this year, but does not appear to have been communicated to the press in any way, or the fact of its having been sent in made public, till two or three weeks after that date. The opinion expressed in it as to the main cause of the disaster must be rather a surprise to those who paid attention to the evidence as given at the public inquiry. The opinion we expressed immediately after the disaster was that it was a lesson on the necessity of designing and constructing buildings so as to be safe in process of construction as well as after their completion; that walls 185 ft. long and 70 ft. high without cross walls could not be considered safe against a gale, as long as they remained practically in the form of an empty and unroofed shell; that the floors should have been filled in and completed as the building went up, and that the walls should have been strengthened by buttresses such as would have formed a portion of any Mediæval cathedral or other wall of the same length without cross walls. The evidence at the public inquiry, as published in the *Glasgow Herald*, appeared as a whole to justify our previous remark that it was not likely the inquiry would elicit anything which would materially modify the above view as to the cause and moral of the calamity. It came out in the evidence that the back wall, the one furthest from the wind, was built on columns (or rather, as now appears, on H-shaped standards); but though this wall was thus undoubtedly less stable than the front wall, it seemed hardly reasonable to think that the fall of a building from the pressure of a violent blast of wind should result from the weakness of the back wall, which was more or less sheltered from the wind, rather than from that of the front wall which was exposed directly to the full force of the gale.

One fact, however, appears in the final report of the Commissioners which did not appear in the original evidence of the public inquiry, and which they appear to have arrived at by independent investigation subsequently. The H-stancheons referred to above had spreading bases, 3 ft. by 2 ft., and 1¼ in. thick, resting on the concrete footings. The stancheons supported a series of cast-iron lintels 2 ft. wide, on which the back wall was carried. The wall, 66 ft. high above these, was 2 ft. thick in the lower story, and 18 in. in the upper stories, the reduction in thickness being made entirely on the inner side of the wall; the method which would no doubt occur to ninety-nine people in a hundred as the most natural manner of reducing the thickness, at a floor level, instead of letting the reduction show externally. It cannot be said, however, that this was the most reasonable or scientific method of doing it, as the result, of course, would be to bring a major portion of the weight of the wall outside the central line of the beams and stancheons, and to a certain extent injure the equilibrium which it is so doubly important to maintain when a great weight is carried on thin iron supports. The special fact, however to which we have alluded, is that not only were the stancheons tilted over towards the outside (which would naturally be expected when the superstructure fell in that direction) but five of the base-plates were found to be fractured, "the projection on the east or outer side being broken off."

The Commissioners attach great importance to this fact as bearing on the cause of the accident. They evidently regard it not as one of the results of the overturning of the back wall, but as mainly contributing to the catastrophe. The stancheons, they say, were no doubt amply sufficient to bear their load as long as it was stationary, "but as soon as an oblique pressure came upon them, in consequence of even a slight oscillation of the wall above, they were insufficient. The base-plate projecting 6 in. beyond the solid part of the stancheon, without stiffening or gusset pieces, gave way in one-third of them at the time of the accident, and, we believe, contributed materially to the failure." The following is the Commissioners' summary of their view of the manner of the failure:—

"The back wall and the stancheons on which it rested were distinctly the weakest part of the whole building. The westerly gust which prevailed at the time of the accident gave precisely the conditions which would test this part of the structure to the uttermost, and take it at the greatest disadvantage. We must conclude that the weakest part of the structure, under the conditions existing at the time, was that to which the failure was due, and now we believe we are in a position to submit a correct explanation of the accident.

The first gust caused the whole building to oscillate, an action which is inevitable in a structure of considerable height, and which should not damage a properly-designed construction, but this oscillation severely strained the back wall, especially towards the centre of its length, and the oblique pressure which accompanied it fractured one or more of the base-plates of the stancheons. The second gust, acting with increased force on the somewhat weakened structure, caused a greater swaying of the building, broke more of the base-plates, and probably tilted some of the stancheons, causing the grinding of the wheels which was observed in the weaving-shed.* The third and strongest gust was probably that which caused the catastrophe. Under its impulse the already weakened wall, deprived of a portion of its effective support by the fracture of the base-plates swayed beyond the narrow limits of its stability, and in its fall not only deprived the front wall of the support of the joists, but actually by their connexions assisted to drag it over. The result was the simultaneous collapse of both front and back walls, as already described."

The evidence of witnesses of the catastrophe (not numerous, it may be observed) was clear to the effect that the whole fall was instantaneous, and therefore allowed no room for the theory advanced by one witness that the upper and more solid portion of the front wall, where no flooring-joists had been set, was first blown over upon the joists and so dragged the whole down: a theory improbable in itself, and obviously not in accordance with the ascertainable facts.

The opinion of the Commissioners as set forth in the above quotation is of much interest, and undoubtedly suggests a new idea as to the manner in which this deplorable catastrophe was brought about. That it may very possibly have happened in the manner here set forth cannot be denied; but we should think the conclusion drawn is much more open to doubt than the report seems to imply. In the first place, it seems rather a curious way to put it to describe a gale blowing against the *west* wall† of the building as giving "precisely the conditions which would test to the uttermost" the weak portions of the wall on the *east* side. It is assumed, of course, that a great deal of the wind pressure on the west wall was transmitted to the east wall through the joists; but these did not go into either of

* The axles of the wheels being, we conclude, connected with the stancheons.

† For the sake of brevity we define the two sides as west and east, though they were not precisely facing those points of the compass.

the walls, nor, from the manner in which they appear to have been secured, does it seem probable that they even butted against them, though there was another kind of connexion in the way of tie, to be described presently. The wind may, as we suggested before, have made a kind of swoop into the interior of this great unroofed shell, and so have fairly burst the walls out, which would account for part of the west wall falling outwards. The east wall, carried on its row of iron sticks, would no doubt have been the readiest to fall; and its faulty construction accounts for the fact of its falling, although not on the side directly exposed to the gale; but we are distinctly of opinion that the west wall fell to the force of the wind, mainly, if not altogether; and as it is unquestionable that this was a strong and very well built wall,—all the witnesses are agreed on that point,—this is, as we before said, the lesson of the disaster: that a long wall strong enough for a covered and floored building may not be strong enough while the building is uncovered and open. Had there been a series of heavy transverse girders built into each wall, and the east wall built as strongly as the west one, we believe both would have mutually supported each other, and the whole have remained standing; but it does not appear that the method of laying the flooring-joists constituted such a tie as to render the two walls either mutually supporting or mutually destructive. There seems to be no kind of proof that the base-plates of the stancheons failed before the fall of the walls; and it appears to us that the stress laid by the Commissioners on the structural weakness of the wall that was on the leeward side of the building, and its effect on the disaster, rests more on assumption than on anything like proof (as they would perhaps admit), and that it tends rather to draw attention aside from the main source of danger, the building of walls of "unlimited" length without sufficient buttresses, and which therefore only become safe against violent winds when the roof, floors, and openings are all closed in.

That it has this tendency to withdraw attention from the main point we see from an article which appeared in a Glasgow paper simultaneously with the publication of part of the report a few days ago, in which, while much is said as to the practical lessons to be drawn from the report, the question of the behaviour of long unsupported walls, as such, is entirely ignored. The Commissioners do not entirely ignore this point; but they merely refer to it in a passing sentence at the close: "It is probable that if the roof, floors, and windows of the building had been completed, no wind pressure which has been observed in this country would have been sufficient to destroy it": almost the very words we used in our comment at the time: and that is the real point of the matter. They add that "it is to be hoped that one result of this disaster will be to ensure that greater attention shall be paid in future to the security of buildings under construction"; a hope which we also expressed, but we also suggested the desirability of building long walls in such a manner as to be stable in themselves, instead of depending on floors, when the floors should rather depend on them.

A great deal was said at the inquiry, a good deal of which was nonsense, in regard to the method of joisting the building and connecting the floors with the walls. The method actually employed was this: the main beams ran longitudinally, parallel with the main walls, and carried on a series of cast-iron columns; the joists were placed transversely, but were not built into the walls, but rested on wall-beams 9 in. by 8 in. supported on stone corbels built into the walls, the beams being anchored into the walls by iron straps. Every third joist crossed the building in a single piece, but how the joists were secured to the wall-beam we do not find precisely stated anywhere; we do not gather that there was anything in the way of straps or ties binding them to the wall-beam, though the latter was apparently well anchored to the wall. This method of laying the joists was objected to by some witnesses as unsafe, as not tying the walls together; it was urged that the joists should have been built into the walls. The Commissioners, and we entirely agree with them here, dismiss this objection as frivolous. No better tie would be got by building a number of ordinary joists into a wall than by laying them bearing on a beam or corbels as described; the walls would be to a certain extent weakened and the hold of the joists would amount to nothing of any importance; everyone accustomed to buildings knows what a large proportion of ordinary flooring-joists are quite loose in the walls. Therefore we think the criticisms that were passed about this method of securing the joists were perfectly mistaken and groundless. But we also think that flooring joists so laid, though with the advantage of not weakening the substance of the wall, were quite inefficient as a tie; and one of our reasons for questioning the opinion of the Commissioners as to the manner in which the building fell is just this—that we do not see, for all the information we can get about the fixing of the joists, that the latter had any such connexion with the wall, or rather with the wall-beam, as would enable them to exert any important pull in dragging over a heavy and well-built wall like what the west wall of the building is described to have been: the joists would have parted from the wall-beam before that. The mistake lay not in this or that way of forming the bearing of the joists, but in the radical error of laying the joists transversely and the girders parallel, instead of the opposite arrangement. Here is a long comparatively narrow building with two walls the long way, without any support or buttressing from cross-walls,—with little or no buttressing of any kind in fact, and it is desired to fix the floors in so as to assist the stability of the whole structure. The theoretical importance of the floors in this respect, under the circumstances, was referred to and recognised again and again in the course of the inquiry. And if this was an object, does it not stand to reason and common sense,—constructional common sense,—that the proper course to take was to fix the large girders transversely, one to each pier, building them into the walls and thus obtaining the important assistance of their mass and weight and strength in connecting the walls together? To neglect this in such case, to lay the main beams longitudinally and only lay the light joists from wall to wall, is a mode of proceeding which seems to us entirely at variance with practical common sense. The Commissioners touch upon this point, but in a remarkably mild manner, and in terms which seem very nearly self-contradictory. In regard to the way in which the floors were actually constructed they say:—

"The mode of supporting the joists at the walls which has been already described was severely commented on by some witnesses, who maintained that the joists should have been carried into the walls. Other witnesses expressed the opinion that the method adopted is superior to the other. This is one of several instances in which experienced practical men have taken diametrically opposite views on points raised in this inquiry. We have no hesitation in expressing our view that the method adopted, which is recommended by most competent authorities, and which certainly leaves the wall stronger than the other does, is to be preferred, and should be adopted in most cases, care being taken to preserve the 'tie' between the front and back walls. This latter point seems in the present case to have received careful consideration, and we have come to the conclusion that the mode of supporting the joists did not in any way contribute to the accident."

We cannot discover any statement in the report or in the published newspaper accounts of the inquiry as to how the joists were connected to the wall, but we agree that the method of supporting them did not contribute to the accident. The report proceeds—

"An important point raised was as to the most efficient arrangement of the floor-beams in such a building. Here again there was a difference of opinion among experts. We are disposed to agree with those witnesses who held that the best arrangement for the general stability of the building is that the beams should run transversely, so as to connect the front and back walls at every bay and on every floor, rather than those who maintained that a better connexion was secured by placing the joists transversely, as in the case of this mill. The point is one of general interest, but is not of importance in this inquiry, as from the circumstances of the case we have concluded that this point had no material influence in determining the fall of the mill."

Considering the weak construction of the back wall, perhaps this may be so; but if the two walls had been equally well built, though they had been each weaker than the west wall actually was, their mutual stability would have been materially increased by having the main girders built into and connecting them; and we must express surprise that the opinion on this point is given in so doubtful and tentative a manner in the report.

The Commissioners also express in very mild terms the opinion, which many who read the evidence would be disposed to express in much stronger terms, that the inquiry disclosed lamentable inefficiency in the constitution and action of the official building authorities of Glasgow. These consist of a Dean of Guild (who we believe need not necessarily be a man of any expert knowledge in construction at all—he appears to be an ornamental official), a legal assessor, and eight persons called "liners," who are supposed to supply the Dean of Guild with the practical knowledge which he does not possess himself. It appears from the evidence in this case that plans of such a building as the mill in question may be passed by the official authority, though there is no adequate or distinct indication on them of the precise method of construction to be employed: and that one method may be implied and accepted by the authorities on the drawings, and another method employed in construction, without any official interference being aroused. The report says:—

"The plans submitted in this case, which were doubtless in accordance with practice such as are required by law, seem to us of a somewhat meagre description. They were so vague as, *e.g.*, to leave doubtful the mode of supporting the joists, the Court believing by reasonable inference from the plans that one method of construction was intended, while the architect has shown that his intention, though not expressed on the plans, was to adopt a different method, viz., that which was carried out. The plans certainly showed the dimensions and construction of the back wall, which we have considered a material factor in the destruction of the mill, but they did not, and being on a small scale, could not show the details of the iron stancheons, which we have also considered as materially contributing to the disaster.

"Again, in the matter of inspection, it appears that although a different method of supporting the joists was adopted from that which the Court understood that it had approved, and this without the authority of the Court or of any one connected with it, no notice was taken of this important deviation, as it should have been considered, from the approved plans."

The question of building the joists into the walls or not, as we have observed and as the Report admits, was of little practical consequence in the matter; but it is evident that if it had been, the indifference of Dogberry would have been just the same. One of the "liners," indeed (the general "practical" insight of these gentlemen, we may say, comes out delightfully in the evidence), finding that his court was not making a brilliant show in the inquiry, attempted to make capital out of this by saying solemnly, "If when these plans came before us in the Dean of Guild Court, the plans had shown corbels and beams, I for one would never have passed these plans." Unfortunately the decision of the Commissioners that the matter was of no practical importance rather takes the point out of this bit of tardy official virtue.

Another very regrettable feature in the inquiry is touched upon, though lightly and in a somewhat indulgent spirit, by the commissioners viz.: the conflict as to responsibility between the architect and mill engineer who were jointly consulted by the building owners. The statement of the latter was that they employed the engineer as a specialist to

make a plan specially adapted for the machinery, driving-gear, supporting pillars, &c., to give the architect information as to these special subjects, the latter being otherwise left to carry out the building as he thought best. There seems to have been room for some misunderstanding between the two as to their respective share in the work. But the architect in his evidence repudiated his client's view entirely, maintaining that he was not responsible for the construction in any way, although he had signed the plans for the Dean of Guild Court; drawing from Colonel Malcolm the very natural remark that he did not know what the value of a signature might be if there was not some responsibility attaching to it. In the progress of the evidence there were further attempts on the part of each professional man to disclaim responsibility and to throw it on the other. In the case of a terrible accident involving serious loss of life, we must say that the spectacle of the two professional men employed each endeavouring to elude responsibility and throw it on the other is, from whatever point of view we regard it, not an edifying one.

Serious blame, however, for the calamity has not been attached to any one concerned, to the extent of direct responsibility for it, still less of criminal negligence. It is a terrible incident in the chapter of accidents, arising from unforeseen and unusual circumstances which were not provided against. But it can hardly now be called an accident if a similar calamity is ever allowed to happen again.

NOTES.

THE Institute of Architects publishes with its last circular an important and suggestive list of points for consideration in regard to building legislation for the County of London. These are grouped under various heads. Among "Definitions" are to be considered "virgin soil," "site" of a building, "centre" of a roadway, "story" of a building: all points on which there are constant misunderstandings. The heading "Erections which are not to be deemed buildings, but to be under control" promises opportunities for better definition of a building; and under the heading of "Exemptions" it seems to be suggested that there may be some means of escape suggested from a hard-and-fast law which often bears very unfairly or at least inconveniently on the erection of small structures such as greenhouse adjuncts &c. Other headings are "Limits of a Building"; "Walls and Floors" including the consideration of the question of lifts penetrating floors and roofs of separate buildings (a new subject for legislation arising out of modern conditions of life in cities); "Roofs," including "access to roofs"; "Frontage Lines"; "Courts of Appeal"; "District Surveyors," including considerations as to limits of fees; "Light and Air"; "Working of Act"; and "Miscellaneous," under which heading are included considerations in regard to "notice boards and hoardings"; "pilasters and cornices of shop fronts wholly of incombustible materials" (it will probably be for the good of street architecture as well as construction if this subject receives some attention); "direct control of District Surveyors over materials and construction," perhaps one of the most important subjects noted, as in fact the practical efficiency of building legislation largely depends on this.

A LIVELY discussion arose at the Railway Rates Inquiry, last week, out of a demand for certain information on behalf of the cotton trade. Different branches of trade are now submitting their views to the Court in turn, but points of general interest frequently arise during the hearing of the case of a particular industry. The cotton traders desired to have returns of cotton traffic, showing the tonnage rate per mile independent of terminal charges. The companies at once scented danger, the nature of which Mr. Pope,—who is representing the London and North-Western Railway,—proceeded to explain. He commenced by assuring the Court and the traders that the companies wished to deal with them with perfect frankness and courtesy, but confessed to a certain amount of alarm at being called upon to furnish a return "which would be of questionable utility now, and might be available for other purposes hereafter." Mr. Balfour Browne denied in the strongest terms that the traders, in asking for these returns, had any concealed motive, or that they wished to use them for any ulterior purpose. The fear of the companies is that the information given may afterwards be made use of by competitive interests,—notably, the Manchester Ship Canal,—and this suspicion will account for their disinclination to furnish it. The magnitude of the traffic may be gathered from the fact that 500,000 tons are annually sent from Liverpool to Oldham. Several instances were given in which sidings were provided and terminal services performed by the trader, but charged for by the company, and the Court should certainly provide for rebates under such circumstances.

WE referred a fortnight ago to the discussion in the Liverpool Town Council in regard to the continuation of Mr. Stirling Lee's series of sculptured panels for St. George's Hall, and to Mr. P. H. Rathbone's offer to bear the cost of the remaining panels of the series, on condition that they were to remain for at least five years, to give time for a matured public opinion on their merits. The question, as noted at the time, was referred to the Finance Committee, which appears to be (perhaps appropriately enough in these days!) the final arbiter in matters of taste. The following extract from the *Liverpool Daily Post* of Saturday last gives the result of the reference:—

"THE ST. GEORGE'S HALL PANELS.—ACCEPTANCE OF MR. RATHBONE'S OFFER.—At the ordinary meeting of the Finance Committee yesterday, under the chairmanship of Alderman Radcliffe, the recommendation of the Council referring to them Mr. Rathbone's offer to complete the St. George's Hall panels at his own cost came up for consideration. Mr. Rathbone, in his letter, said that it was not fair to judge the series by the first two panels of Mr. Stirling Lee, and he stipulated that the remaining four should be placed *in situ* for at least five years, after which, if it was decided by the Council that they were not worthy of their place, they could be removed. The designs of Mr. Lee for the new panels were submitted, and were approved of by several members. Mr. J. B. Smith moved that Mr. Rathbone's offer be accepted, and that he be thanked for his munificence. This was seconded by Mr. Holder. Alderman Livingston proposed, and Mr. J. B. Morgan seconded, an amendment that the Council, having already expressed an adverse opinion on the bas-reliefs, it was not expedient to proceed further in the matter. On a division, four voted for the amendment and seven against. The proposition was then declared carried."

We congratulate both Mr. Stirling Lee and the Liverpool official authorities on the result, and we have little doubt the Committee will discover in the end that they have no reason to regret the decision so tardily arrived at.

AT a meeting of the British School at Athens, on Friday, February 14, Mr. E. A. Gardner read a paper on the technical processes in Greek sculpture, with special reference to a number of unfinished statues which have been found in various degrees of progress, and which are now collected together in the Central Museum at Athens. Mr. Gardner principally concerned himself with the methods of fourth-century sculptors, most of the examples being of that period, but he first noticed a specimen of the early straight-limbed Apollo type, which was found in the quarries at Naxos. This was in the first stage of progress, the figure having been merely roughed out. He showed how this had been done, much as a beginner would proceed to work at the present time, the sculptor first tracing the lines of the figure on the face and sides of the block and then proceeding to rough out the limbs by cutting off the marble in planes parallel to the face and sides. The surface clearly indicated that this had been done with a pointed punch. In this connexion Mr. Gardner said that the squareness of the early statues need not necessarily be traced to a wood tradition, and he was not inclined to accept the theory that most of the early Ξόανα were of that material; he showed that the meaning of the word did not imply this, and mentioned several which were known to have been of marble. He argued that roundness rather than squareness of section was characteristic of wood, and he thought that the square appearance of early marble figures might more naturally proceed from the material itself, the rectangular block of marble on which the sculptor set to work. He then proceeded to trace the processes of execution in the fourth century, and the nature of the tools employed, basing his remarks principally on a statue from Rheneia, which showed different degrees of progress on the various portions of the figure, but referring also to the others as he went on. Beginning with the rough marble block, he showed how they first roughly shaped out the figure with a punch driven with a hammer, and not with a pointed axe or hammer, as had sometimes been assumed; how they afterwards dressed down the lines more carefully with a similar but smaller and sharper instrument, and how, when they had got the figure thus blocked out, they proceeded to model the limbs by cutting down the surface gradually with a curved chisel; and he pointed out on the statue small flat cup-shaped sinkings showing the beginning of this process. The general surface was then finely worked over in detail with a claw-shaped chisel, the form of the limbs being carefully worked up, and the folds of the drapery were drilled out with the running bore. He mentioned, as an instance of a different treatment, an early archaic figure from Delos, where the use of the saw could be distinctly traced in the narrow sunk lines of the parallel folds of the straight hanging drapery. He went on to show how the forms of the muscles were afterwards accurately mapped out or outlined, and how the whole figure was again gone over with a finer claw chisel, and finally finished off with a flat one. He had come to the conclusion, from a careful study of these statues, that the sculptor did not work from a finished model, although he may have had a rough study beside him, but rather that he worked quite freely, developing his ideas as he proceeded.

SELDOM has a town shown so much activity in building as Leipsic has shown recently. The new Booksellers' Exchange, the Conservatoire, the Public Slaughter-house, and the Workhouse are only just completed; and we find already a large number of other public buildings are nearing their completion. Among these we see an extensive "police headquarters," designed by the architect to the town, "Baudirektor" Hugo Licht, showing highly-interesting elevations and an exceedingly practical plan; an "artisans' school," by the same artist, showing some original detail in the façades; a new "central market," chiefly in iron; an extensive library for the University; and a new building for the "art and science schools," which, although it has very poor elevations, and its interior arrangements are not much better, must, at all events, be mentioned on account of the extent of the building. The competition designs, dispositions, cost, &c., of these buildings, and, above all, of the new Imperial Law Courts (which also are progressing rapidly), certainly have at their time interested the average Leipsic citizen; but never before has the whole community taken such a lively interest in an architectural matter as at present in the "Rathhaus" scheme. There has been much difference of opinion in reference to the demolition of a fine old architectural relic, between architects and lovers of art on the one side, and the ordinary layman on the other. Leipsic may well be proud of having such an interesting and grand old Town-hall as the one built by Hieronymus Lotter

in the middle of the sixteenth century; and yet, now that accommodation is wanting in the old place, a large number of the good burghers seem to have a great desire to pull it down, and to erect in its place and on the sites adjoining an unwieldy edifice, containing the offices of the fiscal administration and a town-hall combined. Opposed to this scheme, and backed by the published opinions of the leading architects in Germany,—such as Professor G. Hauberrisser, Regierungs-Baumeister Hoffmann, Oberbaurath v. Schmidt, and Baurath Wallot—we find a design (worked-out and drawn by Herr Reg.-Baumeister H. Solf, according to the ideas and sketches of the above-named town "Baudirektor") which not only saves the old Rathhaus, but also the old Booksellers' Exchange adjoining, and which brings these two buildings very cleverly in connexion with an excellently-planned extension containing all the offices and committee-rooms required. In no way wishing Leipsic to stop its activity in the erection of new public buildings, we certainly in this case hope that the citizens will be satisfied with an extension and a thorough repair of the old Rathhaus; and, seeing that the Town Council contains several members of the architectural profession, we may also hope that these gentlemen, in carrying out work, will unite in the cause of archæology as far as practical considerations render it possible to do so.

STRASBURG CATHEDRAL is the first German Catholic church in which electric lighting has been applied. It had been feared that this new and strong illumination would spoil the solemn and mysterious effect of the interior, and would at the same time modify the colour effect of the beautiful reddish "Vogesen stone" used in the building; but it has been found that although the groups of incandescent lights attached to the piers and columns certainly light up the latter very brightly, the interior as a whole looks quite as well, if not better, than before. Arc lights have been used outside the building, and these show off the details of the façade exceedingly well.

SOME interesting information which would prove highly valuable to engineers has been recently put before the English-speaking branch of the profession in the "Proceedings of the Institution of Civil Engineers." The town of Cueno, in Italy, has been recently enlarging its water supply, and Mr. G. Ponzo, the engineer in charge of the work, has been largely using cement-made tubes in the formation of an aqueduct. He is loud in the praise of cement for such purposes. It is advantageous in regard to economy, in rapidity of construction, in impermeability, and in facility of adaptation to any form. It also preserves the freshness and purity of the water in a most satisfactory degree. The cost of cement tubes is not more than about 40 per cent. of that of iron pipes. At Cueno the new cement pipes were laid in the open channel which formed the course for the old water supply. There is a fall of 77·8 ft., and the new supply having to be under a pressure due to this head, and the tubes having a diameter of 9⅞ in., the thickness should have been, according to the usual formula, 7½ in. Before constructing his tubes, however, Mr. Ponzo made some experiments in order to determine the correct proportions required, and he found that a thickness of tube of 3·15 in. was amply sufficient. The material used was Casle cement, and the cost was 5s. per yard, including labour; or 6s. 9d. per yard including all contingent charges. During the winter the cement set in twelve hours, but later, when two qualities of cement were blended, the setting was perfect in less than seven hours.

DR. BOHME has communicated to a German publication some details of experiments made with volcanic sand from the Eifel Mountains in Germany, in order to determine its value for making mortar. The percentage of silica was about 52·0, of alumina 14·0, of lime 11·0, and of magnesia 7.0 The results appear to have been in some instances really remarkable. As compared with the standard sand, it was found that in every case the volcanic sand gave a higher tensile and crushing strength. A mortar composed of one part Portland cement with three parts of standard sand gave a standard strength of 34·15 kilogrammes per square centimètre (485·71 lb. per square inch) when immersed in water for one year, while a similar mortar when made with volcanic sand attained a strength of 50·15 kilogrammes per square centimètre (713·28 lb. per square inch) in the same time. The crushing strength of the same mortars under similar conditions was 320·8 kilogrammes per square centimètre (4,562·66 lb. per square inch), and 499·1 kilogrammes per square centimètre (7,098·58 lb. per square inch) respectively. Mixtures of different varieties of rich lime and volcanic sand were also far superior to mortars made with standard sand. With proportions of sand higher than those stated the superiority of volcanic sand was still more marked, both for cement and lime mortars. In the matter of adhesion and resistance to frost, also, the volcanic sand gave higher results.

MR. HOWORTH asked a question in the House of Commons on Tuesday as to alleged injuries and mutilations to the Beni Hassan tombs in Egypt, mentioning a report that twenty-five names of kings had been erased and the heads of the principal figures abstracted. Sir James Fergusson knew nothing of it, but promised that inquiry should be made of Sir E. Baring. Beni Hassan is too important a chapter in ancient history for dunces to be allowed to erase at their pleasure.

IN regard to Wrexham Tower, of which we published a view last week, a correspondent writes:—"The statement has been ventured that the tower of St. John's, Cardiff, was by the same architect. The Vicar of Wrexham came thence, but the tradition I mention long ante-dates. Having seen the tower of St. John's, I cannot say there is much to compare. Knowing also the tower of Wrexham from a time when all was considered too perfect for restoration, I recollect that one only of the four pinnacles is original, decidedly a Somersetshire feature. Still, Welshmen have a right to be proud of the tower. There are images of saints on three sides, but none on the north. As to the church, there are internal evidences that the clearstory is additional; also the absence of old woodwork may be the saddest evidence of fire. The doorway and window at the end of the north aisle are new compared to the rest. The window-seat alongside the door comes over joint-over-joint work of a doorway now transposed. Access to a gallery, removed at restoration, led to this alteration, and the four-foil panelling beneath the first weather-mould now ornaments the interior. The windows to the last bay of the clearstory, as well as of the aisle, differ from the remainder. The chancel, 'so called,' quite shows that all was chancel until the east window was broken away for the annexation of an insignificant adjunct to a collegiate church."

UNDER appointment of Mr. Justice Stirling, in the suit of Clark *v.* Clark, the house, No. 14, at the south-western corner of Buckingham-street, Strand, was put up for sale by auction at the Mart, on Tuesday last, and was bought for 10,500*l.* This freehold property, covering nearly 4,000 ft. superficial, and yielding an aggregate rental of 860*l.* a year, or, say, 680*l.* net, stands on the site of a house occupied by Samuel Pepys during the period 1684-1700, and wherein, as their President, he was wont to entertain the members of the Royal Society. Pepys was Secretary to the Admiralty from 1684 to 1688, when Phineas Bowles succeeded him; he was elected P.R.S. in 1684, and held office for two years. In the year 1689 he had for his opposite neighbour, at No. 15, Peter] the Great. The Buckingham-street of Pepys's day had been built in 1675, after the sale for 30,000*l.* of York House, together with its grounds, by the second Duke of Buckingham, who removed hence to College-hill, in the City. Of York House, Hollar made a drawing in 1630, whereof Herbert published a print in 1808. Pepys's house can be identified in a plate of Boydell's "Views" (1778); but a better view of it, and of the Czar's lodgings, may be seen in one of the several Thames-side paintings, by James, *circa* 1750, in, or lately in, the Queen's Presence Chamber, at Hampton Court Palace. When Hatton compiled his "New View of London" (1708), Pepys's house served, as we gather, for the Royal Wardrobe, under the mastership of Ralph, first Duke of Montagu. No. 15 yet remains; No. 14 has been rebuilt. The present house was inhabited by Clarkson Stanfield, R.A., in his earlier career as a scene painter; and, after him, by William Etty, R.A., who, removing hither in or about 1824, resided in it until about fifteen months before his death in his native city, York, on Nov. 13, 1849. We may add that the property has a south frontage of 82 ft. to the private enclosure known as Villiers-walk; and the purchaser is entitled to acquire, by private treaty, the adjacent plot, No. 19, Villiers-street.

THE subject of Westminster Hall was again before the House on Tuesday evening, and the discussion again showed the correctness of our predictions as to what would be thought and said of this piece of archæological tinkering when completed. This time the carriage drive as well as the staircases came under consideration, and one member observed that "Outside had been provided an extraordinary pit for members' carriages, which recalled the lions' den into which Daniel was thrown. It was a kind of *descensus Averni*, a decline down which no carriage could be driven with safety, and in the shed itself it was almost impossible to turn a carriage round. The shed might do very well for bicycles, tricycles, and wheelbarrows; but it was useless for members' carriages. When two carriages were in a third could enter only by backing down the incline." Mr. Marjoribanks might have read something very like this in the *Builder* before the work was ever carried out, just as all the other objections which are now so violently though justly made by excited members were made in our columns before any of the work was carried out, and all that Honourable Members have discovered when it is too late they might have discovered before any of the work was done if they had looked for information to those who could give it. Mr. Shaw-Lefevre seems to have abated very much of his former tone of self-satisfaction over the work he did his best to promote, and, after an admission that "there was no doubt great difference of opinion as to the artistic merit of the work done in Westminster Hall" (he has discovered that at last, apparently), contented himself with a mild protest that the money now asked for in "Supply" was only for the purpose of properly laying-out the ground westward of Westminster Hall; and that of course must be done anyhow: so the vote of 2,000*l.* was agreed to.

ON the same evening, in Supply, the money for the purchase of the land between Prince's-gate and Queen's-gate, from the Commissioners of the Exhibition of 1851, was voted, after a short debate in which the only reasonable objection raised was one in which we rather sympathise, viz.: that before voting large sums for a site and separate new buildings at South Kensington, the original buildings of the South Kensington Museum should be completed. Their incomplete state for so many years is a discredit to the nation.

An "Engineers', Electricians', Builders', and Ironmongers' Exhibition," is announced to be held at the Royal Agricultural Hall, Islington, from March 17 to 29.

LETTER FROM PARIS.

MUCH has been said recently in the Paris press in reference to a supposed new masterpiece by Rembrandt discovered at Pecq, a little town near St. Germain, and which a well-known dealer had purchased for some millions of francs, at a sale of effects of the deceased owner. It was also reported that the new possessor of the picture (of which the subject is "Abraham at table with the Angels"), from motives of patriotism, had refused most advantageous offers for it in order to give the State the option of purchasing it for the Louvre. As, however, the manufacture of "old masters" is at present carried on more extensively than ever in Paris (there was an exhibition very recently, at the Georges Petit Gallery, of a whole set of fictitious Raphael cartoons purporting to have been found in Russia, and said to be far superior to those of Hampton Court!), the artists and the more enlightened portion of the public did not take much interest in this "discovery" of a new Rembrandt, though, as may easily be imagined no pains have been spared to get up an excitement about it. This attitude of scepticism appears to be now justified, as in the opinion of such judges as M. Gérôme and M. Bonnat the picture, though signed and dated, is of very unequal and in part of very bad execution, and cannot be regarded as genuine. M. Bonnat, it may be said, is a kind of expert in regard to Rembrandt, of whose drawings he possesses a remarkable collection. The Louvre is already rich in undoubted Rembrandts, and is not likely to consider any offer for the purchase of a doubtful example.

It is to be hoped that the State will also decline the offer of Manet's "Olympia," which it appears was purchased by the subscription of some artists and amateurs (as noted in our last letter) with the object of presenting it as a gift to the Louvre. Manet was no doubt a remarkable artist in his way, and exercised a great influence on the modern school; but if he is to be represented in the national collection (which seems rather premature) it should at all events be by some work less eccentric than the "Olympia"; though as the picture is offered by persons of considerable position in Paris, there may no doubt be some hesitation about declining it under the circumstances.

At the Hôtel de Ville the second competition for the decoration of the "Siège de Paris" room has just been decided. Five artists were selected to compete again with studies of a portion of each design, the size of the ultimate execution. M. Arus selected a sad enough incident in the combat of Buzenval. M. Adolphe Binet has also chosen a military subject, a battery of artillery: MM. Baudouïn and Delance have, on the contrary, painted the sufferings and dangers of the population in Paris during the Siege: while MM. Gilbert and Dupray, who are collaborators in one design, have illustrated the scene of the despatch of one of the balloons which was to convey information of the state of Paris to the provinces. The fine colour of M. Binet's work, and the animation of his figures, captivated the judges from the first, and they have commissioned him to execute the work. M. Arus receives a premium of 4,000 francs, and each of the other competitors 3,000; 80,000 francs has been voted for the execution of the work.

The Committee for the decoration of the Hôtel de Ville has received with great satisfaction the series of sketches by M. Galland for the decoration of the gallery adjoining and parallel with the three Salons à arcades. M. Galland, who has in this scheme fifteen small cupolas and two pediments to decorate, has elaborated a scheme in which the principal trades of Paris are typified. The artist has been working at this scheme for three years; and as he will be able to commence the work this month, this piece of decoration, on which 120,000 francs will be expended,* may be expected to be completed at the close of the year.

What specially characterises the work of M. Galland is the respect he observes for the lines and details of the architecture,—a matter greatly neglected by many decorators of the present day, as the committee has become painfully aware through many of the sketches of schemes submitted to them; and the process of dividing up the decoration of many of the rooms among several artists is not likely to improve matters in this respect, as there can be no *ensemble*, no prevailing motive or principle, among several decorators working each in his own way on various portions of the same apartment.

The twelfth exhibition of the "Aquarellistes" represents artists belonging to both the sections into which the Salon dissensions have divided the art-world of Paris. Among the best works exhibited are those of MM. Clairin, Duez, Roger Jourdain, and Maurice Leloir, the Spanish scenes of M. Worms, the remarkable drawings by M. Zuber, the illustration designs of M. Boutet and M. Monvel, the flower-paintings of M. Eugène Morand &c. M. Vibert has this year abandoned his eternal cardinals for a scene in which he represents himself as a "Médecin malade." M. Besnard, talented as he is, exhibits water-colours the colour quality of which becomes more and more incomprehensible. On the other hand his designs for windows for the "École de Pharmacie" are very interesting.

The new Salon, which is now currently recognised as the "Salon Meissonier," in distinction from the "Salon Bouguereau," has been definitely accorded the use of the Palais des Beaux-Arts for its first exhibition to open on the 15th of May. The bureau of the new Society is constituted as follows:

President—M. Meissonier.
Vice-President—M. Puvis de Chavannes.
Presidents of Sections—Painting, M. Carolus Duran; Sculpture, M. Dalou; Engraving, M. Bracquemond.
Secretaries—MM. Billote and Jean Béraud.
Sub-Committee of Painting—MM. Dagnan-Bouveret, Lhermitte, Cazin, Gervex, Renouard, Baron, Courtois, Guignard, Besnard, Duez.
Sub-Committee of Sculpture—MM. Rodin, A. Lenoir, and Desbois.

The old Salon will retain its old quarters at the Palais d'Industrie, but important modifications are being made in its regulations: the "exempts" are to be suppressed, and all exhibitors are to pass the ordeal of the jury. The rule which limits each exhibitor to two works, however, remains in force.

A committee presided over by M. Jules Comte, Directeur des Bâtiments Civils, has decided to institute a general return of the examples of tapestry which form part of the "Mobilier national." There are about 600 pieces in the Paris stores of this department, to which it is proposed to add those which are now scattered about in various localities in the provinces, in the palaces at Pau, Versailles, Fontainebleau, and Compiègne, &c. Including the textiles lent to the different embassies of France, there is probably a total of 1,100 examples of tapestry of the first order, and which would form when united a splendid collection. As soon as the inventory is complete, the Gobelins establishment will be charged with the repair of the specimens which are mutilated or damaged, after which the finest examples will be selected for a museum of tapestry to be established at Paris, which will enable the public to become acquainted with artistic treasures of the existence of which it is at present almost in ignorance.

The monument to Paul Baudry, of which we have already given a description, has just been inaugurated at Père-la-Chaise. M. Bartholdi has just completed the model for a monument to Gambetta which a group of inhabitants of Alsace-Lorraine are about to erect to his memory at Avray; it will be placed near the house in which he died. The whole monument will be about 15 mètres high: at the foot will be two groups representing Alsace and Lorraine taking refuge at the altar of "La Patrie." At the summit of the monument will be the figure of Gambetta standing and holding the tricolour flag, which he is supposed to have saved, but with the flagstaff broken. It is stated also that M. Bartholdi has for a long time past had a scheme for a monument to be erected on the Place St. Pierre, at Montmartre, to commemorate the services of the aëronauts during the Siege of Paris, but the difficulty was to manage the balloon so as to give it importance in the design. His last idea is that the balloon should be represented by a great globe of thick polished glass which would contain a powerful electric lamp to light the Place St. Pierre. The monument, if it is ever really executed, will certainly be one of the curiosities of Paris, though it may be doubted whether the effect will be as satisfactory as surprising. M. Bartholdi, who has made a kind of specialty of "original" monuments, has not been always very happy in his originalities, witness the bronze lion on the Place Denfert-Rocherau; and he might contrive to symbolise the aëronants by something more capable of decorative treatment than a balloon.

While on the subject of colossal monuments we may mention the crusade that has been preached by the Bishop of Verdun in favour of Jeanne d'Arc, in whose honour a great national subscription is proposed for a colossal monument at Vaucouleurs. The pedestal of this monument is to be nothing less than a representation of a Mediæval château, flanked by four solid towers, and fortified with machicolations, battlements, a drawbridge, &c., all constructed according to the rules of ancient military architecture. The château will be dominated by a *donjon* raised at least 40 mètres higher, on the summit of which will be placed a colossal group representing Jeanne d'Arc on horseback led by two armed men. Such a scheme will demand money of course, and the Bishop of Verdun commenced on a recent Sunday a series of preachments and collections in the Madeleine in furtherance of this object, which he proposes to continue in a tour through France. The project has, however, been much opposed, as there has already been commenced an important monument at Domrémy, the birth-place of the heroine, designed by M. Paul Sédille; and a commemorative group of sculpture, now nearly finished, was commissioned in 1880 from M. Allar. This monument was interrupted in 1884 for want of funds, and 350,000 francs are still required to complete it. The success of the Bishop of Verdun's appeal would therefore probably prevent, for an indefinite time, the completion of the Domrémy monument.

The Institut de France has received an important legacy from the late M. Piot, a learned collector of works of art, who has left the bulk of his fortune to the Académie des Inscriptions et Belles Lettres. The Fine Arts section is also left an annuity of 2,000 francs, intended to be bestowed alternately on a painter and a sculptor. The Louvre has also benefited by M. Piot's will, and among other objects receives a picture by Raphael and a terra-cotta by Donatello.

Each member of the Institut has received recently a copy of a medal presented to the Duc d'Aumale in commemoration of his gift of Chantilly. The medal is a remarkable and artistic work of M. Chaplain, bearing on the obverse the profile of the Duc d'Aumale and on the reverse a view of the Château of Chantilly.

The question, long discussed, as to a diploma for architects has entered on a new phase; and, on the proposition of M. Charles Garnier, as President of the Société Centrale, the Government has appointed a Commission charged to make a study of the legal conditions under which the profession of architecture is exercised, the system of studies by which entry is gained to the profession, and the nature of existing diplomas of any kind in sanction of these studies. A scheme of questions prepared by the Société Centrale, and which deals with both the practical and theoretical side of the question, has been submitted to this Commission, which held its first meeting on February 11, under the presidency of M. Larroumet, Directeur des Beaux-Arts.

At the École des Beaux-Arts, the Jury of Architecture, under the presidency of M. Ginain, has considered the forty-four designs sent in competition for the "Edmond Labarre" prize, of which the subject was "Le Siége d'une Grande Commandement Militaire," a very fine and one would think an inspiring subject. The prize has been decreed to M. Despradelle, pupil of M. Pascal; and "mentions" to M. Eustache, pupil of M. Ginain; M. Heubès, pupil of M. Pascal; M. Majon, pupil of M. Guadet; M. Huguet, pupil of M. Blondel; and M. Louvet, pupil of MM. Louvet and Ginain.

The death of a well-known art critic, M. Ernest Chénau, is to be recorded. He was one of the Inspecteurs des Beaux-Arts under the Empire. He leaves several works on painting of considerable value; among others "l'Art et les artistes modernes en France et en Angleterre;" "La peinture Française au XIXme Siècle"; "Les Nations Rivales dans l'Art." We have also to notice the death of M. Duruy, one of the many architectural engravers who worked on the *Revue Générale de l'Architecture* and on the *Motifs Historiques* of M. César Daly. For some years past, however, M. Duruy had entirely devoted himself to the work for the large Dictionnaire for the Académie Française.

* 4,000*l.* on the decoration of one corridor of a great public building. What a satire on the ways of our English State and municipal authorities in regard to art: what a chorus of indignation would arise from "economic" members if such a proposition were made at Westminster or Spring-gardens!—ED.

ROMAN ARCHITECTURE.*

BY PROFESSOR AITCHISON, A.R.A.

Palaces.

I THOUGHT I might as well say a few words on the Imperial Palaces of the Romans, as they are the most glorified form of houses. They were vast in size, their rooms were large and sometimes colossal, and designed to be worthy of the magnificence of the Masters of the World, with the exception of the Palace of Augustus, which was small in extent, and whose rooms were modest in size. If we were fortunate enough to have the plan of Nero's Golden House, it would, I think, be the plan of the largest palace in the world.

The plans of some of the palaces show great ingenuity, and there is an evident desire to make the State-rooms, of those built after the days of Augustus, as magnificent as possible, by grandeur of size, by ornamental shapes, and by sumptuous decoration.

The scraps of precious marbles, and of carving, would show how magnificent their linings were, both inside and out, even if we were without express statements of their sumptuousness in the Roman writers.

Beyond their plans, the costly fragments, and the loose descriptions of their magnificence, all is darkness,—a darkness, too, hitherto impenetrable to our eyes and our researches. Pliny's letters, through the studied elegance of their language, have come down to us, and in them we find a rough description of two of his villas, and thus know something of the arrangement and use of the rooms. We get, too, a glimpse of the decoration of one room, with its carved marble dado, and its painting of birds and foliage above.

In the palaces, alas! we know nothing of the uses of the rooms—we can but guess at the uses of a few; and the historians merely speak of the gold, ivory, and mother-o'-pearl, of the costly marbles and gems lavished on the interior of Nero's. Here and there amongst the ruins the painted decoration of some upper-servants' rooms have been found, which are just enough to whet our appetite for the lost magnificence of the master's halls. We can scarcely imagine that it never entered the head of a court-page, usher, or chamberlain to write a book on the arrangement and adornment of the State-rooms, and on the ceremonies of the Court; but it is not common for such persons to acquire a style that will make their book a treasured possession when the ceremonies have ceased and the palace is in ruins. Such descriptions are generally slipshod and bombastic, and soon find their predestined end at the hands of the pastrycook, the grocer, the butterman, or the stoker. A dining-room, baths, fountain-rooms, and some of the meanest offices proclaim their use, but to find out the destination of the bulk of the rooms seems to defy our attempts, as we neither know the officers employed, nor the usual ceremonial, so that each room can only be described as a fine large oval, circular, square, or oblong room, with columns, niches, recesses, or windows. The value of the architect's and sculptor's work is, however, not wholly lost to posterity; we can often trace the plan, when excavations are made, even when the structure has been pulled down, from the bottom of the walls being mostly covered by rubbish, which has by concealing them prevented their total destruction, and can thus judge of the architect's skill in planning, and of the elegance or coarseness of his mouldings. A few scraps may reveal to us the sculptor's genius, skill, care, and knowledge; but it is only through exquisite verbal descriptions that the past can be sufficiently preserved to enable us to re-create and re-people it,—I say *exquisite* verbal description, for if it be not exquisite it perishes too, so true is Horace's remark:—

"Many, many have lived, who were valiant in fight,
Before Agamemnon; but all have gone down,
Unwept and unknown, in the darkness of night,
For lack of a poet to hymn their renown."†

The first of the Royal palaces, after the Republic, was that of Augustus, on the Palatine. We know from Suetonius that he first bought the house of Hortensius, the orator, and used it for his residence. (Suet., "Aug.," 72.)

We also read that his house on the Palatine was burnt down and rebuilt by the subscriptions of the veteran soldiers, the judges, the tribes, and the people ("Aug.," 57); but whether it was the same house of Hortensius we do not know. Still I think that if that which is called the house of Augustus were his, it must have been built or rebuilt for a palace, as so many of the rooms are evidently designed for State purposes. I think, in fairness to this autocrat, we ought to admit that he had some public virtue. Suetonius ("Aug," 21) says:—"By the character which he thus acquired, for virtue and moderation, he induced even the Indians and Scythians, nations before known to the Romans by report only, to solicit his friendship;" and as Lucian makes Dionysius, the Sicilian tyrant, get off from being tied to the back of the Chimæra through Aristippus "alleging that he had been ready and judicious in his pecuniary gifts to several men of learning" (Lucian's dialogues, "Menippus; or, the Oracle of the Dead"), we also should make some allowance for the patron of Horace, Virgil, and Livy, and for the rule of a despot that allowed the works of Sallust, Ovid, Tibullus, Propertius, and Cornelius Nepos to be published. But whether we condemn him as a tyrant who riveted the chains of slavery on the Roman people, or absolve him by saying the time had come when Rome was unable to govern itself, we must allow he had a wiliness and astuteness that were almost superhuman, which induced him to show as little arrogance and ostentation as possible. With this object in view, he made his palace small in size and of common materials, so that it by no means equalled in magnificence the greatest houses of the nobles. The space covered on the ground-floor was but about 259 ft. wide by 213 ft. deep, but it was about as deep as wide on the first floor, viz., about 252 ft., or more, where its front was on the higher ground. Its south front is not half the length of that of Diocletian's, 592 ft.; it is less than Blenheim, which is 323 ft.; and less than Castle Howard, which is 292 ft. On the ground-floor it consists of an entrance corridor, from a street at the side of the Circus Maximus, leading into a peristyle. At the opposite end, next the peristyle, are three rooms of unique shape, and with all the characteristics of Byzantine work, and the only light they get, except through the doors, is from circular openings through their vaults into the rooms above: the two side rooms are octagons, with four semicircular niches on the slanted sides, and three oblong recesses, with a niche at the back of each on the three square sides, the fourth side being the door. These two halls look like audience chambers; the centre one is called by Guattani the Chalcidicum, and is supposed to have been used by Augustus when hearing cases. The Chalcidicum seems to be a square vaulted chamber, with a large semicircular niche on the right and left sides, and an oblong recess with a niche at the back, opposite the door. On each side of the niches are passages, the front one leading right across that end of the building to an open court on one side, intercepted only by the two other halls, which are entered through their niches; the passages on the further side of the niches in the Chalcidicum lead into a suite of three rooms with closets at each end. If you consider that each passage had a curtain where it abutted on to the Chalcidicum, you will understand that no arrangement could be more safe or convenient; the two back rooms next the passage could be filled with guards, and another with such lawyers or friends as he might wish to consult, and he could slip through the curtains, enter these back rooms, or he could go into either of the halls on each side, by the front passage, or to his private apartments, either on the ground or first floor, as there are staircases by the sides of the open courts. The two flanks of the peristyle contained the rooms belonging to the baths, an open court, and perhaps other rooms,—certainly one large room on each side, nearly of the proportion of a Triclinium, shown by Guattani without window or door openings; so that we are led to the conclusion that the walls were destroyed to the level of the ground when the Abbé Rancoureil had the palace excavated. The whole plan is perfectly symmetrical on a centre line drawn through the centre of the entrance to the centre of the Chalcidicum. Taking, therefore, the front on one side of the entrance, we find, adjoining the peristyle to the south, two oblong rooms with the corners cut off, separated by an oval room at right angles to them, whose semicircular ends project beyond the width of the former rooms, thus forming a sort of Greek cross. Towards the front are two circular chambers, with passages round two of their sides, that communicate with the front and the oblong chambers before mentioned; between the passages of the circular chambers, the oval room, and the front, is a small oblong room. There are no rooms that would answer to the ordinary dining-room (Triclinium), except the two on the flank before mentioned, which are shown without either door or window openings.

Augustus was a spare eater, and may have preferred a circular dining-room, only admitting of eight persons at the most; but this could not have been the case when he had the fancy-dress supper-party representing the twelve gods and goddesses of Olympus, where he played Apollo. He may, and probably did, dine on the first floor. We also know that the Empress Livia passed some of her time spinning amongst her maids; and his sister and two grand-daughters, who probably passed much of their time in the palace, used to spin too.

Suetonius ("Aug." 73) tells us: "He seldom wore any garments but what were made by the hands of his wife, sister, daughter, and grand-daughters." So there must, one would fancy, have been rooms for weaving, fulling, and dying, not to speak of the rooms where he dictated to his secretary, his workshop, or museum (Suet. "Aug." 72), the rooms where his grandsons, his own philosopher, and his grandsons' tutors lived, and the kitchens and pantries; not to speak of the rooms for the chamberlain's pages, ushers, and guards.

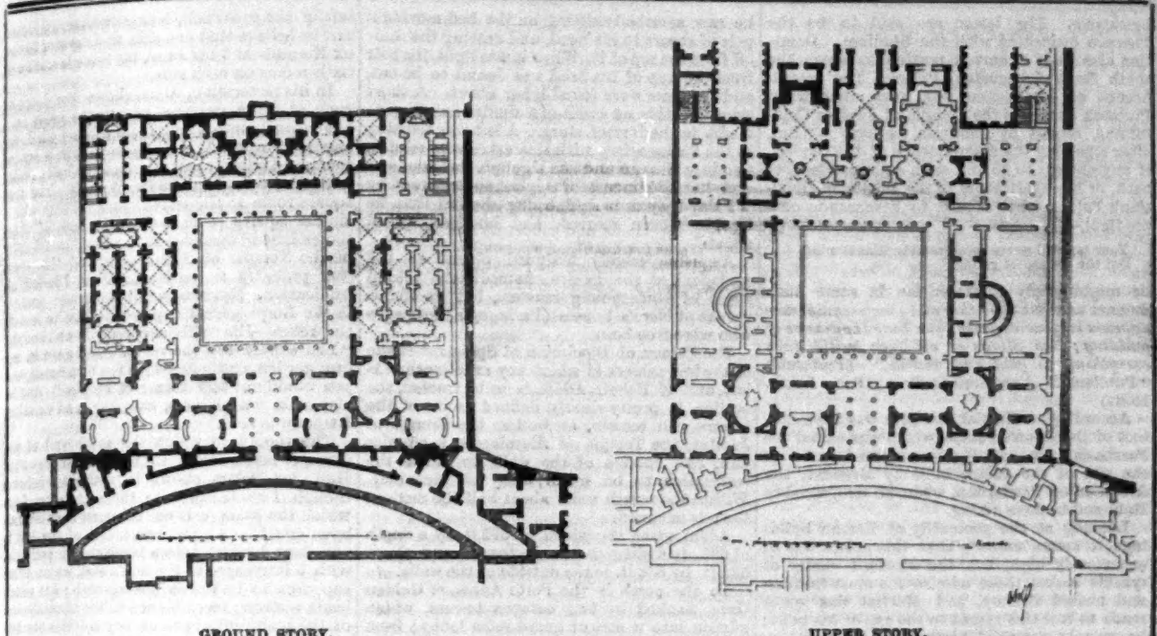
On the first-floor the palace was entered from the north, *i.e.*, from what was the back on the ground-floor; the two staircases from the ground-floor land there. The back part above corresponds precisely with the rooms of the front part below. On the flank there are only two narrow oblong rooms, and one of moderate size, with a semicircular end projecting in front of the former rooms, with an outside passage all round it.

The back part below, as I said before, becomes the front above, entered from the back of the grounds of the Temple of Vesta, and it seems thus laid out:—First, there was a lobby with two cells on either side, probably for porters or guards; the lobby led into a small Atrium with a small Tablinum at the back, opening out on to a room over the Chalcidicum, and possibly two small Triclinia to the right and left, with passages and an ample space between for guards, servants, and for serving tables, the ends of the Triclinia opening out on to two rooms, if I may so call them, over the halls of audience beneath. Nowadays we should fancy them to be rooms adorned with flowers and shrubs, because they could not well have been used for much traffic, seeing there were marble gratings in the middle, some 6 ft. or 7 ft. in diameter. It is possible that the Triclinia were so small because these end rooms served for the mountebanks or buffoons to perform in. Suetonius says ("Aug.," 74) he "introduced buffoons and stage players, or even low performers from the circus, and very often itinerant humourists, to enliven the company." The plans given are enlarged from those by Guattani. In 1775, the Abbé Rancoureil discovered these remains and had them excavated, and the plans taken by the architect Barbari, from whom Guattani had them, and published them in his "Monumenti Antichi Inediti" (1784-5). The Abbé was very jealous of any one seeing the ruins, much less taking dimensions; but Guattani says Piranesi paid some of his people to take them at night, at the risk of their lives, for fierce dogs were kept there as well as watchmen; and I believe Piranesi published plans which M. Deglane has accepted, but they differ somewhat from Guattani's. From Guattani's statement, the architect Barbari, who could measure and plot them at his ease, is much more likely to be correct than Piranesi's people, who had to get them by stealth.

When the Italian Government has this palace re-excavated, we shall know which plan is right, for after the Abbé had had the palace excavated, he had it filled in again. The site had been previously searched by the Spada family, who found there the antiquities still adorning their palace; but the former search must either have been superficial or incomplete, for the Abbé found the Apollo Saurocteno, now in the Vatican Museum, two statues of Leda, one of which is in England, a head in metal, other heads, busts, and parts of figures, as well as numerous fragments of capitals, cornices, friezes, &c.

* Being the fifth Royal Academy Lecture on Architecture this session, delivered on Monday, February 10. (For the four previous lectures, see the *Builder* for Feb. 1, 8, 15, and 22 respectively.

† Hor., Lib. IV., ode 9, canto 7, Sir T. Martin's translation.



GROUND STORY. UPPER STORY.

Plans of the Palace of Augustus on the Palatine: after Piranesi.

(Reproduced from the *Gazette Archéologique.*)

On the ground in front of the palace, on the first floor, Augustus constructed a vast portico with upwards of fifty fluted columns of Giallo Antico, and enriched the portico with statues of the Danäides between the columns, and in front of the columns with fifty equestrian statues of the sons of Egyptus the husbands of the Danäides, all of whom were killed by their wives, with the exception of Lynceus the husband of Hypermnestra, who succeeded Danaus as King of Argos. Although these murders are said to have been condoned, the poets make the Danäides condemned to draw water in leaky vessels after they had crossed the Styx.

At the north end of this portico, Augustus built and dedicated a temple to Apollo, commonly called the Palatine Apollo, on a spot that had been struck by lightning. Once before, when in Spain, he had escaped when the slave who carried a torch before his litter was killed by lightning, and in consequence he dedicated a temple to Apollo Tonans. (Suet., "Aug." 29.)

The Sibylline books were kept by Augustus's orders in two gilt coffers in the pedestal of the statue of the Palatine Apollo, according to Suetonius, ("Aug."31), though the originals were burnt when the Temple of Jupiter Capitolinus was destroyed in the wars between Marius and Sulla, but fresh copies were obtained from Greece, Italy, and Asia Minor. Between this temple and the palace was a circular temple to Vesta, which only projected enough to break the peristyle surrounding the Temple of Apollo; there are grounds to the Temple of Vesta, as well as a grove, and a house for the Vestals, and to the right of it, and nearly in a line with the portico of the Temple of Apollo, was the celebrated library of Augustus, called the Apollinean Library, filled with the Greek and Latin authors, and where the Senate occasionally met.

Tiberius built a palace to the left or west of that of Augustus, and, according to M. Deglane, considerably to the north of the north front of Augustus's Palace, so as to avoid the houses of Livia and Germanicus and the Temple of Jupiter Victor. In the grounds at the front of this temple, which faces the south, Tiberius seems to have built his libraries, with peristyles at the back of them, which abut on the flank of Augustus's Palace. I may here remark that Thon's, Canina's, and M. Deglane's plans so greatly differ from one another that they cannot be reconciled. My description is from M. Deglane's plan, which is from the latest excavations.*

To the north of the Palace of Tiberius, and extending beyond it to the east and west, Caligula built his palace, and there was a passage to the north of the house of Livia that ran along the east side of the Palace of Tiberius, in which the demented tyrant, Caligula, is supposed to have been killed; subsequently Nero built his Golden House nearly from the Circus Maximus at the south end, to the Quirinal Hill at the north. Some of the lower chambers of his palace are under the Theatridion of Titus' Baths. Vespasian built the Colosseum on a part of the Golden House; and a part of it was seemingly demolished to make room for the Basilica of Maxentius—at least it is so shown in Pirro Ligorio's drawings, and it extended eastwards to the ground in front of the Cœlian Hill.

A plan of the former palaces and some of Nero's Golden House is given in C. Thon and Ballanti's work on the Palace of the Cæsars (Fol. Rome, 1828, with text in 8vo.) and in Canina's plan of Ancient Rome.

When my old friend, M. C. Lucas, the well-known French architect, heard I was going to touch on the palaces of the Cæsars, he was kind enough to mention it to M. A. Levy, the Editor of the "Gazette Archéologique" and "Le Moniteur des Architectes." M. Levy, with that magnanimity which so distinguishes our brothers across the Channel, not only presented me with M. Deglane's article and plans of the palaces of Augustus and Domitian, but gave me leave to publish the plans, and offered to lend me the plates. As it is entirely through the kindness of these gentlemen that I have been able to give a description of the last discoveries and restorations of the palaces of the Cæsars, I take it for granted that I may return your thanks with my own to Monsieur C. Lucas, M. A. Levy, and M. Deglane.

The palaces of Augustus, Tiberius, Caligula, and Nero being built, the only spaces left were two pieces of ground, the first extending from the grounds of the Temple of Jupiter Stator to the Libraries of Tiberius, and the other from the Library of Augustus to the south front of his palace. From the first plot at the north end a piece had to be left for the grounds of the Temple of Jupiter Stator, and a wide road between it and Tiberius's Palace, as an approach to the back of the Temple of Jupiter Victor. There was thus left an oblong site, extending southwards from the grounds of the Temple of Jupiter Stator to Tiberius's Libraries, and from west to east from the road to the Temple of Jupiter Victor to the enclosures of the temples of the Apollo Palatine and Vesta, and the west flank of Augustus's house.

The second plot was on the east side of Augustus's Palace, extending lengthwise from the Apollinean Library to the Circus Maximus, and crosswise from the east flank of Augustus's house to a part of Nero's Palace, supposed to have afterwards been restored by Septimius Severus. On the first-mentioned plot Domitian built some State-rooms; in the middle was a large open peristyle, to the north was a magnificent hall, called by M. Deglane the Tablinum, and by Professor Middleton the Throne-room. It is divided lengthwise into five bays by six columns, with piers at the back of each column, forming recesses, and at the back of each recess is a square niche; the ends are divided into three bays by four columns; at the north end is an entrance in the middle, and a recess on either side the doorway. At the south is a flat apse in the middle, and two doors on either side; in the apse the Emperor is supposed to have sat on his throne; to the left is a Basilica, where it is supposed he gave judgment; and at the back of it a passage, staircase, and small room.

On the right of the Tablinum is a Lararium, or private chapel, a staircase, and a room nearly square. The east side of the peristyle touches the wall of the grove of Vesta: to the left or west side are a series of five rooms, a circular one in the middle, with semi-circular rooms at either end of it, and at each of the extreme ends is a shallow oblong room, also with one semi-circular end; the semi-circles do not touch one another, but are joined by a wide passage forming an oblong recess to each semi-circle. You see by the plan that there are spaces between the outer walls and the semi-circles which are formed into four rooms or recesses in the shape of lunettes. At the south end of the peristyle is a magnificent Triclinium or dining-room, with a Nymphæum, or fountain room, on either side, and at the back of the western Nymphæum a few small rooms.

You at once see the change that had come over the people and the Emperor. Augustus tried to avoid ostentation, and to house himself and family modestly. Tiberius, when he was made Emperor, said he had a wolf by the ears. Nero himself is supposed to have perished through building such an enormous palace; but Domitian built four or five State rooms on a site that is bigger than that of Augustus's Palace: the Throne room, about 115 ft. by 80 ft., would nearly occupy a fourth of Augustus's Palace: and you must remember that Domitian had all the other palaces for habitation as well.

On the other plot Domitian built a Stadium with a large apse or hemicycle in the middle, in which he probably sat. He seems, like Nero, to have been passionately fond of the games, and is reported by Suetonius to have had girls run for prizes. There are some small rooms at the south end, as well as at the back of the

* This plan was given as a lithograph in the last number of the *Builder*.

hemicycle. The latter are said to be the Thermæ connected with the Stadium. Domitian also made a curved portico to screen the south front of Augustus's Palace. The magnificence of his palace was such that when Plutarch describes the Temple of Jupiter Capitolinus, rebuilt by Domitian, he says:—"But, after admiring the magnificence of the Capitol, if anyone was to go and see a gallery, a hall, or bath, or the apartments of the women in Domitian's Palace, what is said by Epicharmus of a prodigal,—

'Your lavish'd stores speak not the liberal mind,
But the disease of giving;'

he might apply to Domitian in some such manner as this:—*Neither piety nor magnificence appears in your expense; you have the disease of building; like Midas of old, you would turn everything to gold and marble.*" (Plutarch's "Publicola." Langhorne's Tran., 8vo. Lond., 1801.)

According to Martial, Rabirius was the architect of Domitian's Palace, which was called the Parrhasian, because it was supposed to be on the site of the palace built by Evander, the Arcadian or Parrhasian, when he emigrated to Italy and became a king.

Looking at the generality of Roman buildings, it seems unlikely that this palace was so enormously high, but the diseased vanity of tyrants makes them admire the most fulsome and absurd flattery, and Martial was quite ready to fool this tyrant to the top of his bent; he meanly revenged himself for his own servility by abusing Domitian after his death, and it is thought by some that Trajan looked upon him with disfavour on account of this marked characteristic of sycophants, and that in consequence he left Rome and died in poverty at his native town of Bilbilis in Spain.

This is his epigram (Lib. VIII., 36):—

Smile, Cæsar, at the pyramids' loud fame;
Memphis, no more thy barb'rous wonders name;
Th' Egyptian works reach not the smallest part
Of the Parrhasian court's majestic art:
No such illustrious piece the day does show;
Nor Sol in's universal travels know.
Seven vast pavilions, like seven mountains, rise,
Pelion on Ossa scal'd not so the skies;
Thunder and clouds beneath, th' aspiring top
Enters the heavens, and 'gainst the stars does knock;
The sun salutes it with his early'st ray,
On highest hills 'tis night, when here 'tis day.
Thy palace, 'bove th' Olympian though renown'd,
Unto its lord is not yet equal found."—*Anon.* 1695.

In front of the building, to the south of the Library of Tiberius, M. Deglane shows a building which he calls the Pædagogium, or dwelling of the Court pages, oblong in form, with a slanted side next the Circus Maximus. The building consists of a long and narrow peristyle, with four rooms on either side; and, in addition, in the centre of the north side is a hemicycle, and corresponding with it on the south side is a large room with a segmental back. There are corridors at both ends, the west one returning round a part of the south side. At the back of the east corridor are two good-sized rooms, and a large one in the middle of them; and in front of this, to the east, is a deeply-recessed portico opening on to a grand staircase.

The pædagogus was originally a trusted slave, to whom the sons, and sometimes the daughters, of the house were given in charge to be taken to and from school and the gymnasium. The main duty of the pædagogus was to keep them out of mischief; he was the same sort of person in Roman times as the tutor was here in the last century, whom Horace Walpole irreverently called a "bear leader." We read about the pædagogus in the "Bacchides" of Plautus; but under the Emperors the court-pages were the sons of freeborn citizens.

It got to be a fashion amongst the great to choose their pages, who were mostly slaves, for their beauty, and to dress them in the most magnificent manner.

Pliny (N. H Lib. XXXIII., cap. 12), in speaking of gold with which the women bedizened themselves, says:—"Much more becomingly do we accord this distinction to our pages, and the adorned beauty of these youths has quite changed the features of our public baths." We read in Pliny the Younger (Lib. VII., lit. 27) that the pages had an apartment to themselves in great houses called the Pædagogium; in telling us of Roman spirit rapping, which then took the form of hair-cutting, and of the ghosts that remind one of a story in the tales of old Japan, he says:—"I have a freedman Marcus, not an illiterate man. As he and his younger brother were lying together in the same bed, he fancied he saw somebody sitting on the bed moving a pair of shears to his head, and cutting the hair off from the top of it. When it was light, the hair from the top of his head was found to be cut, and the hairs were found lying about. A short time after this, an event of a similar nature gave credit to the former story. A lad was sleeping in the Pædagogium with the rest. As he relates, two in white shirts came through the windows and sheared him as he was lying, and returned by the way they came. The day showed that he also had been sheared, and his hair spread about."

Augustus merely assigned places to the pædagogi at the games, immediately behind those of their young masters, but Suetonius speaks of Nero's houses (Pædagogia) for pages who were free born.

The Palace of Diocletian at Spalatro* is one of the few palaces of which any exact outline is left, and if Robert Adam is to be trusted, the outline is pretty clearly defined; some of the towers still remain, as well as the Temple of Jupiter, the Temple of Æsculapius, a circular hall, and enough of the walls to enable the restoration to be made with fair accuracy. Within the palace walls about half the modern town is enclosed.

Adam gives the width as 592 ft. by a depth of 698, including the angle towers, and about 532 ft. by 638 ft. to the outside of the walls.

To the north is the Porta Aurea, or Golden Gate, flanked by two octagon towers, which admits into a sort of guard-room lobby; from this lobby a straight street, about 35 ft. wide, with a covered passage on either side, leads up to the steps of a tetrastyle portico. At right-angles to this, and in the middle of each of the enclosing flank walls, is a street of the same width with the same covered walks, going from the east to the west gate, which are called respectively the Bronze (Porta Ænea) and the Iron Gate (Porta Ferrea). All round the inside of the walls up to the Palace itself are a series of cells with a covered walk in front of them, probably barracks for his guards, with a pair of staircases by each gate to lead to the ramparts. [See lithograph plan.]

Illyria and Dalmatia were notorious for piracy, and nothing could have offered a greater temptation than an emperor's palace to plunder, with beautiful women and handsome pages to be sold in the slave-markets, had not the Palace been well garrisoned.

In the two islands to the north, formed by the crossing of the streets, are two large blocks of buildings, detached from the covered walk of the barracks by open streets about 30 ft. wide, their southern walls form the back of the covered walks to the cross streets, and their eastern and western of the main street, near the Porta Aurea.

To the south of the cross streets are two open squares, walled in on three sides, and screened off next the street by an arched colonnade to each. In the area of the east square is the octagon temple of Jupiter, and in the west square is a small temple to Æsculapius,—at least, these are the names given them by Adam.

Severus Alexander, who lived some sixty years before Diocletian, had two private chapels in his palace: one dedicated to the Virtues and the other to the Talents. In the first he put statues to Alexander the Great, Abraham, Orpheus, Apollonius of Tyana, and Jesus Christ.

In the other he had statues of Achilles, Cicero, Virgil, and of other famous men, and offered sacrifices to them every day.

From the portico before-mentioned the body of the palace is entered by a doorway in the centre of the back wall of the portico, and leads into a circular chamber about 38 ft. in diameter, with four niches from which you enter a hall (possibly) of audience, about 98 ft. long, by 80 ft. wide, but divided into a nave and two aisles by six columns, leaving the nave about 45 ft. wide. Opposite the entrance is a door to the enclosed portico or cloister facing the sea; in the upper or north corners are two closets about 12 ft. square, and the same spaces are cut off at the south or lower end, and contain circular staircases. In each side of the hall, near the upper end, is a doorway leading to a passage which communicates with the other rooms of the palace; this hall was probably an Egyptian one, as it has no windows. Just as in the house of Augustus, each side of the Palace to the right and left of the great hall, is exactly alike, and leads one to believe that one side was devoted to the ex-Empress and her suite, for there is a suite of bath-rooms on each side.

In his restoration, Adam shows four doors to each of these passages, one to the great hall, one opposite into a long room without windows, one at the north end, opening into a square room, and one at the south end into a hall parallel with the sea, about 88 ft. by 59 ft. The first square room to the north communicates with a similar square room to the west, both of these rooms having openings 26 ft. wide into the court of the Temple of Æsculapius, and this court was probably a garden. After Diocletian's abdication, Maximianus, his former partner in the Empire, tried to persuade him to resume the reins. His celebrated reply is well known: "You should see the vegetables I grow in my own garden, cultivated with my own hands, and you would not talk to me of empire." And he also said, "An honest, cautious, and excellent Emperor is sold."

The room into which the south end of the passage leads seems to be another Egyptian Hall, for Adam shows it without windows, though I am inclined to think the room from which the passage is cut off must have been an open court. At the south end of the last is one door leading into a large oblong peristyle, with a large apse to the north end, which Adam supposes to be the swimming-bath; but which bears a strong resemblance to the sterquilinium of the house of Augustus, beyond this are two rooms 31 ft. and 25 ft. wide, and 64 ft. long, which Adam calls the sphæristerium, and cœnatio. At the back of them, beginning at the west and working east, there is a passage, five rooms, and a staircase; the first room from the passage is trefoil shaped, which he calls Diocletian's bed-room, and the other four rooms baths.

We must thank Adam for what he did, not blame him for what he possibly could not do. Probably additional information could be obtained if the Emperor of Austria would be at the expense of excavating, and put the work into the hands of some of his learned architects; at any rate they should find the hanging flues of the bath-rooms, probably the flue and water-pipes; but as it is the rooms are arbitrarily named. I may here say that in this, as in the house of Augustus, the repetition of the halls and baths certainly points to male and female sides of the house.

Nothing remains now but to examine the two blocks of buildings in the North-East and North-West Islands; the remains of the North-West show an open peristyle with two long galleries on the east and west sides and two short ones at the north and south ends. Adam, in his restoration, calls it "Gynæceum, Textrinum, seu Conclave, apartments for matrons and young women," literally the women's apartment, the weaver's shop, or the cage.

The one in the North-East Island he calls Aulicorum Ædes, or apartments for courtiers. Diocletian began his palace in 303, abdicated in 305, and died in 313. As he was unable to protect his daughter Valeria, the widow of Galerius, from being banished to the deserts of Syria by Licinius, I fear his courtiers, if he had any, were merely dependents, and it is possible it was the Pædagogium or the Hospitium.

It was customary for the wealthy to have an Hospitium, or part of the house set apart for the lodging and entertainment of foreigners who had rights of hospitality with them. We know something about it in the Greek house from Vitruvius (Lib. VI., cap. 7, p. 4), but nothing about it in the Roman house, except from stray passages in the Classics. When Trimalchio at his dinner-party describes his house he mentions this part. His description is as follows:—"I built this house. As you know, it was a cottage, now it is a temple; it has four dining-rooms, twenty rooms, two marble porticoes, above a series of many cells, a bedroom in which I sleep, the dwelling-place of this viper (his wife), an excellent porter's box, the guests' quarters (Hospitium) take a hundred guests. In short, Scaurus, when he comes here, is never unwilling to put up; yet he has by the sea his paternal guest-chamber, and there are many other parts, which I will show you." (Pet. Sat., cap. 77.) This Ædes Aulicorum may have been the guests' quarters; and, as we are absolutely ignorant of how the guests were accommodated, it may be that they were lodged in a kind of barrack.

This block has also an open peristyle in the middle, three rooms to the north, and three to the south, a room on either side of the par-

* It is now spelt Spalato, but I give the name from Robert Adam's "Ruins of the Palace of the Emperor Diocletian at Spalatro in Dalmatia." (Fol. 1764.)

style to the east and west; two passages with staircases at each end, the west ones circular, and two closets, 14 *ft.* by 6 ft., to the west. Adam makes the peristyle like the Tepidarium of a bath.

The plan of this palace is a commonplace one, and, as far as we can judge without knowing to what purpose the buildings to the north-east and north-west islands were devoted, not particularly convenient.

The square hall to the south-east, too, cannot have had much light, as its window is within 6 ft. of the portico surrounding the Temple of Jupiter, unless, indeed, the room shown at the back was an open court. The architectural proportions are generally odious, the mouldings are coarse and commonplace, and the floral sculpture is hardly equal to the productions of the commonest plasterer of Drury-lane; but, for all this, Diocletian's palace is one of the most interesting buildings in existence, and the one most fraught with hope for the architects of the present day.

In the first place, we see the work of independent thought in many parts of the building, quite as strongly as its want of taste. In the entrance portico the architect wanted a central feature, so he bent the whole entablature into a semicircular arch, resting on the two central columns. He wanted to hide the temple as little as possible by the screens, and so made the arches spring directly from the capitals of the columns. He wanted to ornament the upper piece over the doorway of the Porta Aurea, between the two towers, and put an arcade resting on columns that were carried by corbels; and lastly, he wanted to build a dome without centering. Why it is so encouraging to the architects of the present day is readily explained: it shows that to however low a state architecture has fallen, the seeds of a new style may be planted so soon as men begin to think for themselves, and to act boldly and logically on their convictions; for here we see an architect who was halting between two opinions, who adhered to his precedents so long as he could do so without damage to the effects he wanted, but who boldly threw them aside when they interfered with his conceptions. This palace is the halfway house between the Hellenistic architecture of Rome and the Roman architecture of Byzantium, when it was freed from the trammels of a style that did not suit its constructional advance.

SCULPTURE ON GREEK TEMPLES.—I.

ROYAL ACADEMY LECTURES.

MR. A. S. MURRAY, Keeper of Greek and Roman Antiquities in the British Museum, delivered the first of a course of three lectures on "Sculpture on Greek Temples" at the Royal Academy on the evening of Monday, Feb. 17.

Mr. Murray commenced by quoting a passage from the play of *Ion*, by Euripides, to show that usually the sculpture on a Greek temple was disposed in the pediments, metopes, and frieze. But there were some important exceptions to that rule. There were columns which, instead of being merely fluted, were partly sculptured. It happened that the only examples of sculptured columns, known either from ancient literature or from actual remains, were those of the Temple of Diana at Ephesus. The site of that temple was some years ago largely, though not completely, explored by Mr. J. T. Wood, at the instance of the British Museum. Among much that rewarded his unwearied labours, the first thing that attracted general attention was the large sculptured drum of a column, now to be seen in the British Museum, with other parts of similarly sculptured drums. These sculptured drums had belonged to the last temple of Diana,—the one which was erected in the time of Alexander the Great, and which lasted down into Christian times. It was a building of immense size, great wealth, and a source of much profit to the citizens of Ephesus at various periods of its history. The character of the sculptured drum referred to was sufficient to determine its date; besides, we had the statement of a Roman writer that a certain number of the columns of that temple had been sculptured,—*columnæ celatæ*, as he called them. It was supposed that these sculptured columns had been placed in the front and at the back of the temple. But points of more interest, perhaps, were—(1) how far up were they sculptured? and (2) on what sort of base did they stand? With regard to the first question we had a certain amount of evidence on a coin of Ephesus, which gave a view of the front of the temple. That coin was quite clear and explicit on the point that the columns were sculptured only on the lowermost drum; but in view of the diversity which existed among the pieces brought to the British Museum, it had been argued that the sculptures had reached higher up the column, though it was not easy for us to reconcile our tastes to such a prospect. One would rather suppose that among the sculptured columns there had been some differences of dimension. That was not impossible, and in that event the different sizes of the sculptured fragments would be accounted for. Then came the question of the base. We possessed in the Museum a number of square sculptured blocks from Ephesus. On the top surfaces of these blocks a circular bed had been made to receive, evidently, the base of a column; and it was a singular fact that these circular beds were just the size to receive the columns of the temple. If four of these square blocks were placed back to back, so as to form a cube, and if on the top of them were set the large sculptured drum, it would be found that the latter fitted on to the prepared bed. But the effect was questionable. The square blocks were sculptured in very high relief, and when they were immediately surmounted by a sculptured drum in comparatively low relief, there was a striking effect of conflict and confusion, in an artistic sense. To some extent that effect would be lessened by interposing between the two sets of sculptures a simple architectural base, as the late Mr. James Fergusson proposed. But even then it was doubtful if the result would be nearly satisfactory, and on the whole, perhaps, a sculptured column would be better without a sculptured base to stand on. Since Mr. Wood's discoveries at Ephesus we had become acquainted with the results of the German excavations at Pergamon, which was not far from Ephesus. The sculptures there found were of a later date, but they agreed with those of Ephesus in having an equally strong tendency towards the colossal. They included a large series of colossal reliefs, above which rested an extensive colonnade with fluted columns of the Ionic order. A glance at the German publication illustrating the remains at Pergamon would show that that extensive sculptured base, supporting a long colonnade of simple fluted columns, had an admirable effect. Guided by it, he (the lecturer) some time ago tried the experiment in the Museum of placing above two of the square sculptured blocks a cast from a simple fluted column found by Mr. Wood on the site of the temple at Ephesus. It fitted excellently, and so far as he had learnt the opinion of competent judges, the effect artistically met with general approbation. Reverting to the sculptured drum from Ephesus, the subject represented was believed to be Alcestis being led to the lower world by Thanatos, the god of death, and by Hermes, the guide of souls on their journey thither. The youthful figure on the left was not exactly what we expected in Thanatos, and yet it was not altogether unsuitable. But no better explanation of the subject had yet been found. As regarded the sculpture itself, the lecturer said he hesitated to say that he was no great admirer of it; but it was necessary to give an opinion, because some authorities, entitled to every respect, had expressed themselves otherwise. They appeared to have been influenced by the tradition that one of the columns of the temple had been sculptured by no less an artist than Scopas. But even if that tradition had been quite explicit, which it was not, it would not follow that Mr. Wood had found that particular column; the chances were rather the other way. Nevertheless, a distinguished German was prepared to recognise in that sculptured drum, if not the work of Scopas, at least the influence which his presence in Ephesus was likely to exercise, supposing he had been in Ephesus. That was an easy way of arguing, and it might mean much or it might mean little. But we were fortunate in knowing the style of Scopas from several fragments that had survived, and we could see that it was immeasurably above that of the Ephesian drum. We had, on the one hand, two mutilated heads from the sculpture of a temple by him at Teges, in Arcadia; of these, casts were to be seen in the British Museum. On the other hand, we also possessed in the Museum part of a marble frieze, representing a charioteer, which belonged to the Mausoleum at Halicarnassus, and which, it was generally felt, must be part of the work of Scopas on that monument. With these limited materials it might seem that we had too little to furnish an adequate notion of his style; but it was to be remembered that what was known of him generally pointed to a peculiar gift, which would show itself best of all in the faces of his figures. It happened that in these surviving sculptures the heads were remarkable for the excellence with which they rendered a particular type of youth which Nature employed when she desired to reveal in the face some permanent mood or pathos in the soul. So far as the *general* conception of such a type of youth was concerned, that might be said to have been attained some time before Scopas in the heads of many of the youths on the Parthenon frieze. The tendency of Scopas was to develop that type throughout the whole structure of the face and head. It was a task requiring the utmost refinement of observation and delicacy of execution, side by side with a preservation of all that was essential to strength and power. In one of the heads from Tegea, and in the charioteer from the Mausoleum, the throat was strongly marked, and stood out in contrast to the softness of the cheek and the almost pathetic expression of the eye and its socket. In the other head from Tegea there was a pervading pathos combined with the greatest refinement of execution, as in the eye, cheek, nostril, and mouth. The lips were marked along the inner edge with an incised line, as in bronze sculpture. When we attempted to compare these fragments of the work of Scopas with the sculptured drum from Ephesus, we were met at first by the negligence of execution which pervaded the Ephesian sculpture. On mere negligence of execution one would not lay any great stress (that was a failing that might be accounted for in many ways), provided the work altogether was of a high character of conception. But he (the lecturer) could see no such high character of conception in the Ephesian sculpture. The draped figure of Alcestis in the middle of the group was little more than a study of drapery,—like many of the terra-cotta figures from Tanagra, but hardly so fine as some of them. The faces and nude forms of Hermes and Thanatos had nothing to raise them above the level of the work of a well-trained sculptor in the latter part of the fourth century B.C. No doubt there was considerable difficulty attendant on sculpture on a round surface. In that respect the sculptor had displayed a good deal of talent, and was entitled to full credit for it. Before leaving the Temple of Diana at Ephesus, the lecturer discussed the sculpture on the huge square blocks, which was, as before stated, in very high relief. Mr. Wood had assigned these blocks to the frieze of the temple, but there were several insuperable obstacles to their location there, not the least being the fact that among these blocks there were at least five corner-stones, whereas a Greek temple was content with four corner-stones in the frieze. For purely ocular purposes one would gladly place these very high reliefs very high in the building. But it was quite certain that they were placed low down, and that they supported columns. Some defence would be looked for of that proceeding of giving very high relief low down, on the level of the eye, or nearly so. Such defence, he thought, was to be found in the fact that the base of a large temple like that of Ephesus must at the first sight have conveyed an impression of vast solidity and strength, and if the artist or architect must have sculpture on it, he had no choice but to give his sculpture very high, strong relief; and having decided on that, what could he do better than choose for the subject of his sculptures the labours of Herakles, the strongest of all Greek heroes? If sentiment could help him, it was there in abundance. The lecturer said he need not describe the various labours of Herakles represented in those reliefs, but the fact was worth bearing in mind that on the part of the temple at Ephesus, where an impression of the greatest possible solidity and strength was necessary, we found sculptured the labours of Herakles in high, powerful relief.

The lecturer next went on to speak of some earlier sculptured fragments (including parts of columns) found at Ephesus, belonging to the temple which was burnt down by Herostratos. An artistic peculiarity of this temple was that the cimatium of the cornice was sculptured, not with a plant ornament, as in the later temple and in most others, but with groups of figures, in low and delicate relief, between the

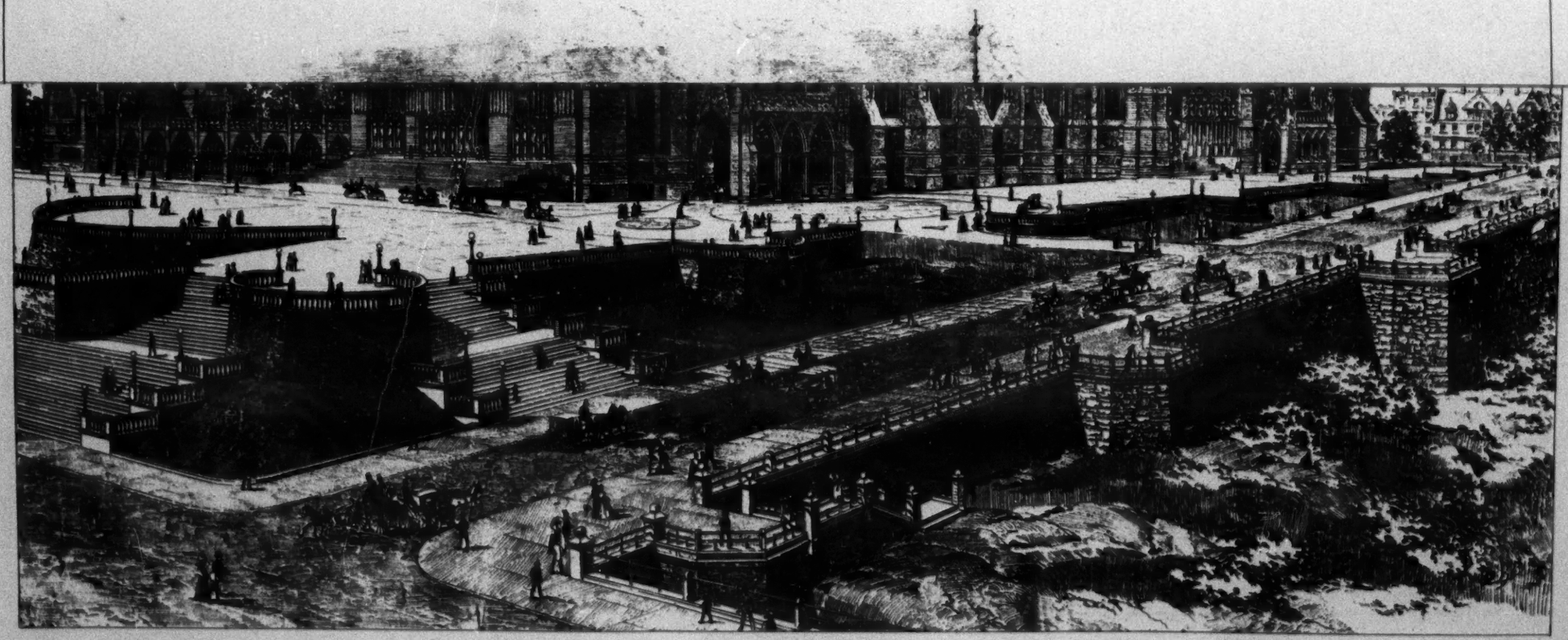


PHOTO-LITHO. SPRAGUE & Co. 82, MARTIN'S LANE, CANNON ST., LONDON, E.C.

COMPETITION DESIGN FOR NEW YORK CATHEDRAL.—Mr. R. W. Gibson, Architect.

PERSPECTIVE VIEW

lions' heads which served to carry the rain from the roof. The lecturer then directed attention to the figures called Telamones or Atlantes, which were employed in the Greek Temple of Zeus at Agrigentum, in Sicily, and, in conclusion, referred to the Caryatides of the Erechtheion at Athens as forming another notable exception to the general rule as to the situation of sculpture on Greek temples.

[We hope to give reports of the second and third lectures in our next.]

Illustrations.

COMPETITION DESIGN FOR NEW YORK CATHEDRAL.

THIS is a design submitted in the competition for the proposed cathedral at New York, by Mr. R. W. Gibson, an English architect, who has migrated to and settled in New York.

As will be seen from the drawings, the design is purely Mediæval in plan and architectural character, but of an unusually rich type. We understand that there was an impression among the competitors that the promoters of the competition wished for what may be called an ecclesiological design; an impression which appears to have been to some extent a mistaken one, but which may be taken to justify the adoption of the purely Mediæval type by competitors, as it would be of no use to offer people in a competition what they did not want. The result of the competition appears to have shown that the promoters have more modern views than was anticipated. If so, we think they are in the right, and that a leading city in the new world should endeavour to strike out a new type of cathedral. But this does not alter the fact that Mr. Gibson's design is a fine and rich architectural conception on the model of a Mediæval cathedral.

We understand from the architect that he forwarded us a detailed description of his design, but this has unfortunately not reached us, and we can only therefore leave the design to speak for itself.

CENTRAL TOWER AND CHAPTER-HOUSE, LINCOLN.

THE illustrations of these well-known features of one of the finest and at the same time most finished and artistic in style of the English cathedrals, are from the set of sketches by Mr. John Begg which have gained for him this year the Pugin Travelling Studentship of the Institute of Architects.

PLAN OF DIOCLETIAN'S PALACE AT SPALATO.

THIS plan, giving the palace as restored by Robert Adam, is reproduced from one of the diagrams illustrating Professor Aitchison's fifth Royal Academy lecture on "Roman Architecture," and is referred to and described in that lecture, which we print in full in other columns.

The English Iron Trade — The English iron market has had another relapse this week, mainly the result of the speculative influences which have been upsetting the ordinary conditions of trade during the past month. There is, on the contrary, less apprehension of a disturbance of business from a general miners' strike, as there is some prospect—which, we trust, will not be falsified by subsequent events—of a peaceable settlement of the pending dispute. The pig-iron trade is especially affected by speculation. The Glasgow warrant market has been flat, and the effect has been to further depreciate Scotch makers' iron. In the north-west also makers have reduced their quotations of mixed numbers of Bessemer iron by 2s. a ton. In the latter district, as well as in the north of England, the difference between warrant prices and those quoted by makers is still about 6s. to 7s. a ton, and for hematites as much as 10s. The southern pig-iron markets are likewise weaker. This tendency is less pronounced in finished iron and steel; nevertheless, prices have given way to some extent, without, however, interfering with their general steadiness. The orders booked for new ships are still scarce, and engineers are beginning to report a similar experience.—*Iron*.

THE ARCHITECTURAL ASSOCIATION:

SOME TYPICAL GREEK BUILDINGS.

IN the course of the discussion which followed Mr. R. Elsey Smith's paper on this subject,* Mr. Stannus, in moving a vote of thanks to Mr. Elsey Smith for his interesting paper, said that Mr. Smith was to be congratulated upon the good use which he had made of his opportunity as Greek Travelling Student of the Institute. He was to be envied for the opportunity he had had of visiting Athens, as well as commended for the good use he had made of his time, and they could not sufficiently thank him for the trouble he had taken in so generously bringing before them some of the results of his visit. He thought Mr. Smith had done well to confine his attention to two or three typical buildings. The plan of the Propylæa at Athens† was an exceedingly interesting one, and Mr. Smith had been able to lay before them the newest lights on the subject, thanks to the kindness of Dr. Dörpfeld. The manner in which Mr. Smith had explained the beautiful and exceedingly complex plan of the Erechtheion was very instructive. That and the other buildings on the Acropolis at Athens furnished together an admirable illustration of the elasticity of the Greek style. People had long had an idea that in Greek architecture everything must be rectangular or on one axial line, and that everything must be on the same level. The light which had been thrown on the buildings of the Acropolis of late years had dispelled that idea. He need not remark on the admirable refinement of detail which characterised the Greek work; but strong as might be our admiration for it, it did not follow that it would bear exact reproduction in this country. The delicacy of Greek work was not suited either to our duller climate or to the coarser materials in which we built. Dr. Temple (now Bishop of London), in one of the essays which appeared in "Essays and Reviews" many years ago, referring to the early Christians, said that we should do, not what they did, but as they did. Similarly he would say with regard to Greek architecture, that we were not called upon to do what they did (and if we were called upon we could not do it), but we ought to strive to work in their spirit. In conclusion, Mr. Stannus spoke highly of the admirable way in which the paper had been illustrated by drawings and photographs hung on the walls, and by photographic lantern-slides thrown on to a screen.

Mr. H. O. Cresswell seconded the vote of thanks, and also expressed his appreciation of the way in which the paper had been illustrated.

Mr. Owen Fleming said that the plan of the Palace of Tiryns was exceedingly interesting as a specimen of the domestic architecture of the ancient Greeks, a subject in which there was a great deal of latent interest. In the writings of Homer we found the palaces of the kings and primitive heroes described fairly fully, although, no doubt, with some poetical licence. A study of Homer in conjunction with the plan of the Palace of Tiryns suggested many interesting questions. He cordially supported the vote of thanks to Mr. Elsey Smith.

Professor Roger Smith said the subject was one of great, and, he was happy to think, of increasing, interest. It was very satisfactory to see that more and more attention was being paid to Greek architecture, and that mainly because of the extraordinary thoroughness and completeness with which all kinds of Greek buildings were executed. As had been said by Mr. Stannus, we did not want to do Greek work at the present day; and if we did we could not do it. The circumstances were different,—we had not the marble and we had not the Greek sky over our heads, and if we had both those things, the circumstances of to-day were quite different. The extraordinary accuracy and beauty of Greek work, and the pains taken with every detail of it, the attention which was paid to proportion and to every other matter, was remarkable, and full of instruction for us in the present day. There were one or two curious points about the plan of the palace of Tiryns. He was glad to hear the inquiry which had been made about domestic Greek architecture, but this palace was really the first perfect bit of it that had been revealed. There was, he hoped, a good deal more to be learnt from it yet, not merely from the study of Homer, but from actual buildings, some of which possibly remained to be discovered. At present we had in the palace of Tiryns the only complete example of a Greek domestic building. It was interesting to see how completely the old Greeks separated the men's from the women's parts of the house. Another point to which he would allude was the plan of the Acropolis, which showed that the Greeks were by no means slavishly addicted to placing their buildings at the same angle to one another. It was only necessary to glance at the plan of the Erechtheion to see that regularity was not even adhered to in a single building.

Mr. F. R. Farrow, in supporting the vote of thanks, said that Mr. Smith had practically put before them the results of the most modern investigations of the German and other archæologists who had done so much to throw light upon questions of Greek archæology.

The Chairman, in putting the vote of thanks, said that like some former speakers in the discussion, he had not been to Greece, and therefore he could not judge of the effect of these marvellous buildings, although one might realise their effect to a very great extent from the excellent photographs which had been thrown on the screen that evening. Although those enlarged photographs gave them an excellent idea of the general appearance of the buildings, yet they were devoid of that beauty and colour which made them such beautiful objects to look upon even in their ruin. He had, however, been to Sicily a few years ago, and there he saw some remains of Greek temples, which, although very fine, were constructed of a rather coarse yellowish sandstone, not altogether satisfying to the eye. Still the effect was very fine, and having seen the Greek architecture of Sicily he could very well understand how fine must be the appearance of the work in Greece. He was glad to hear Mr. Stannus refer to the fact that Greek architecture was not necessarily rigid in its lines, and not tied down to hard and fast rules. The Greeks, who were naturally artists, did practically what they liked, and they could not help doing the right thing. He quite agreed with what had been said as to Greek work. We should study it and learn from it without seeking to directly imitate it; we should rather work in the spirit of the style than attempt to follow it in the letter.

The vote of thanks having been carried by acclamation, Mr. R. Elsey Smith briefly replied, and the meeting terminated.

* See *Builder* for Feb. 22 p. 137.
† Given in the *Builder* last week, page 138.

THE ARCHITECTURAL ASSOCIATION VISITS:

THE IMPERIAL INSTITUTE.

THE second sessional visit of the Architectural Association was made on Saturday afternoon to the Imperial Institute, Exhibition-road, South Kensington, and was attended by a large number of members.

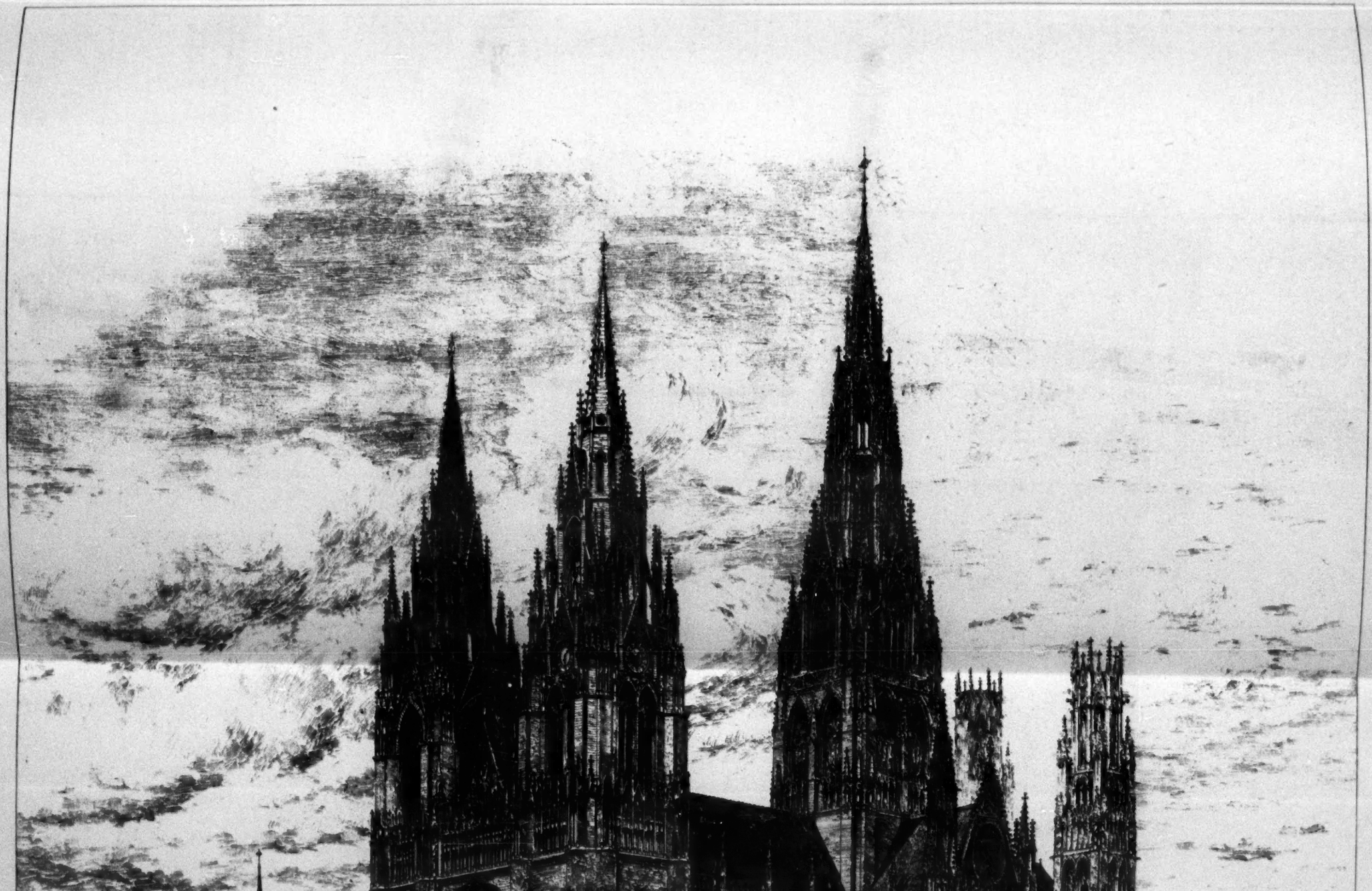
The party was received by Mr. T. E. Collcutt, the architect, who, in addition to pointing out the main features of the structure, gave an interesting description of a series of careful tests which had been applied to the different materials employed.

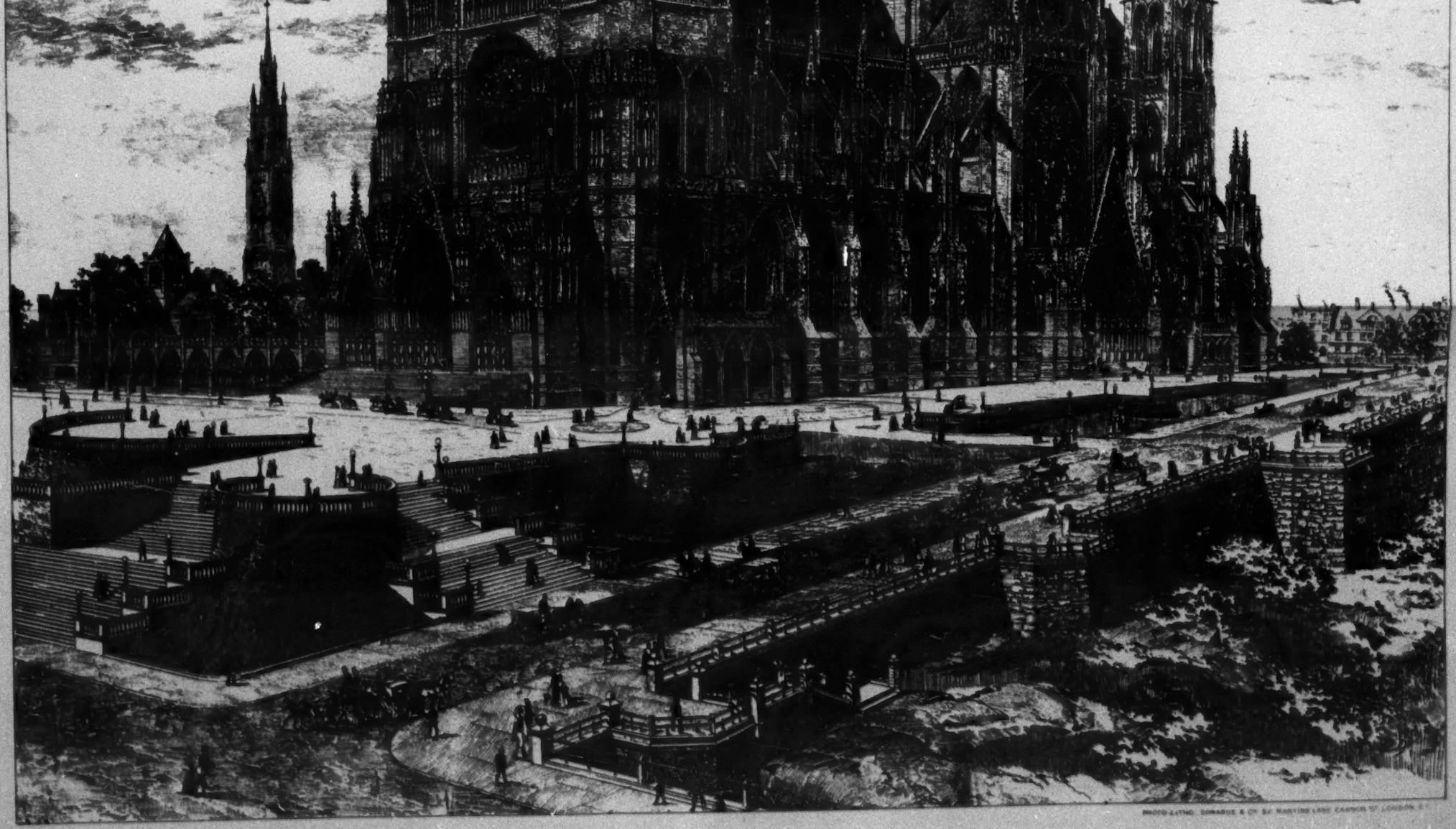
The building, at present confined to the front block, has not been raised much above the level of the first floor, but the inspection of the detail, and the careful workmanship of the Hopton Wood stone internal dressings, excited much interest.

The foundations have been taken down to a stratum of blue clay found at a depth varying from 12 ft. to 26 ft. below the level of the site.

The footings and the walls of the ground floor have been built of London stocks and Portland cement mortar, but Jenning's Parkstone wire-cut bricks have been used in the body of the central tower, and of those piers which sustain much weight. Portland stone is being used in the elevations.

Official Architecture in Prussia.—According to an official notice, the Prussian Government has, during the year 1888, had the superintendence of the erection or alteration of 503 buildings. Of these works, 44 were churches and 33 vicarages, 96 elementary and 8 high-class schools, 33 buildings belonging to the University system, 8 for scientific collections, and 2 to be used as hospitals; the government and administration required 10 new homes, the town and provincial law courts numbered 22, and 19 prisons had to be taken in hand.





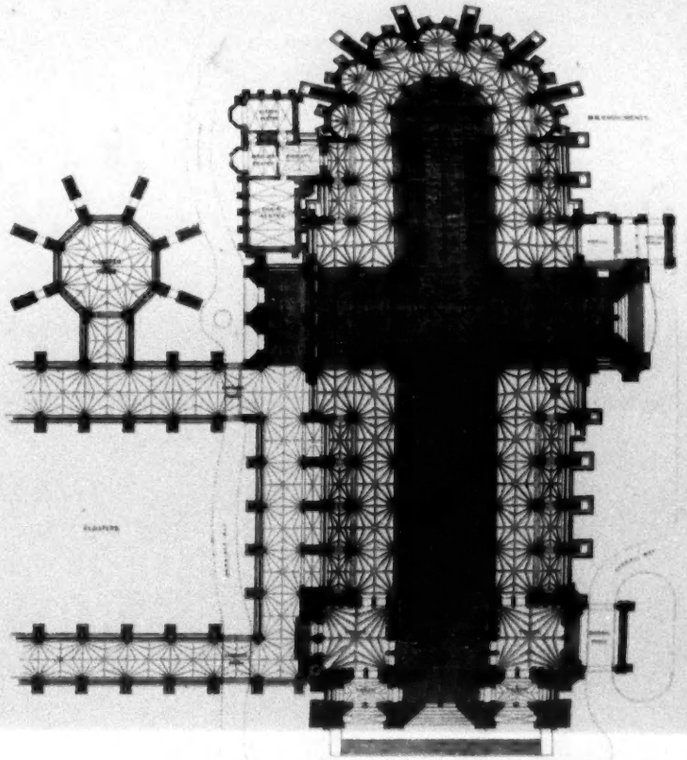
COMPETITION DESIGN FOR NEW YORK CATHEDRAL.—Mr. R. W. Gibson, Architect.

PERSPECTIVE VIEW

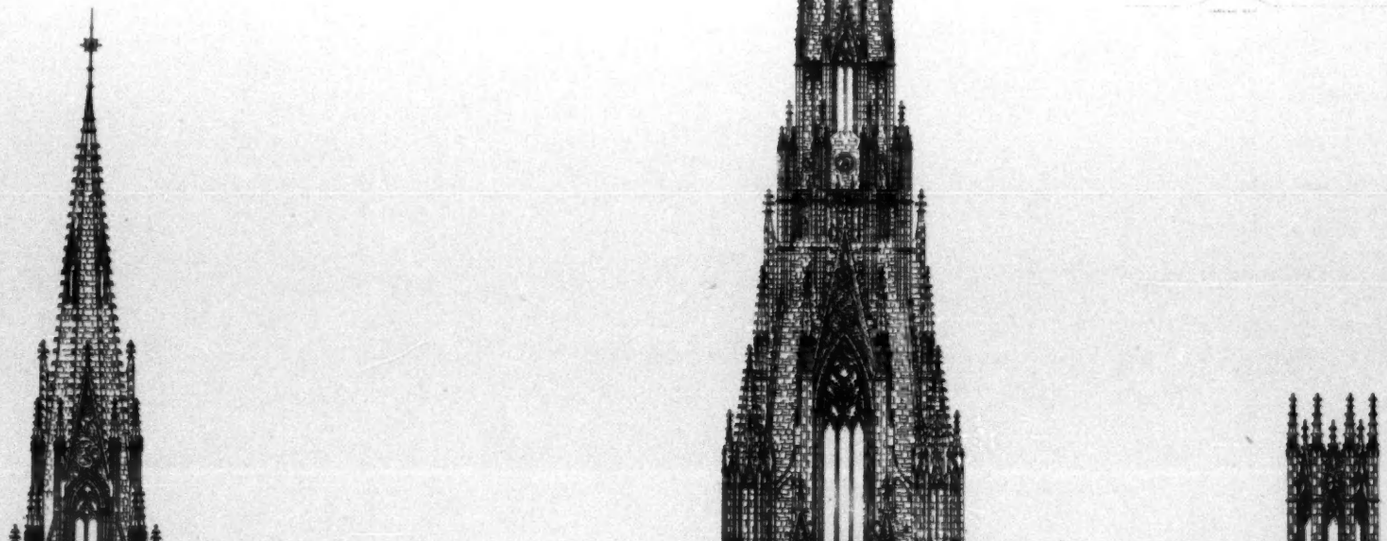
COMPETITION DESIGN FOR NEW YORK CATHEDRAL.

MR. R. W. GIBSON, ARCHITECT.

CATHEDRAL OF ST. JOHN THE DIVINE NEW YORK



GROUND PLAN.

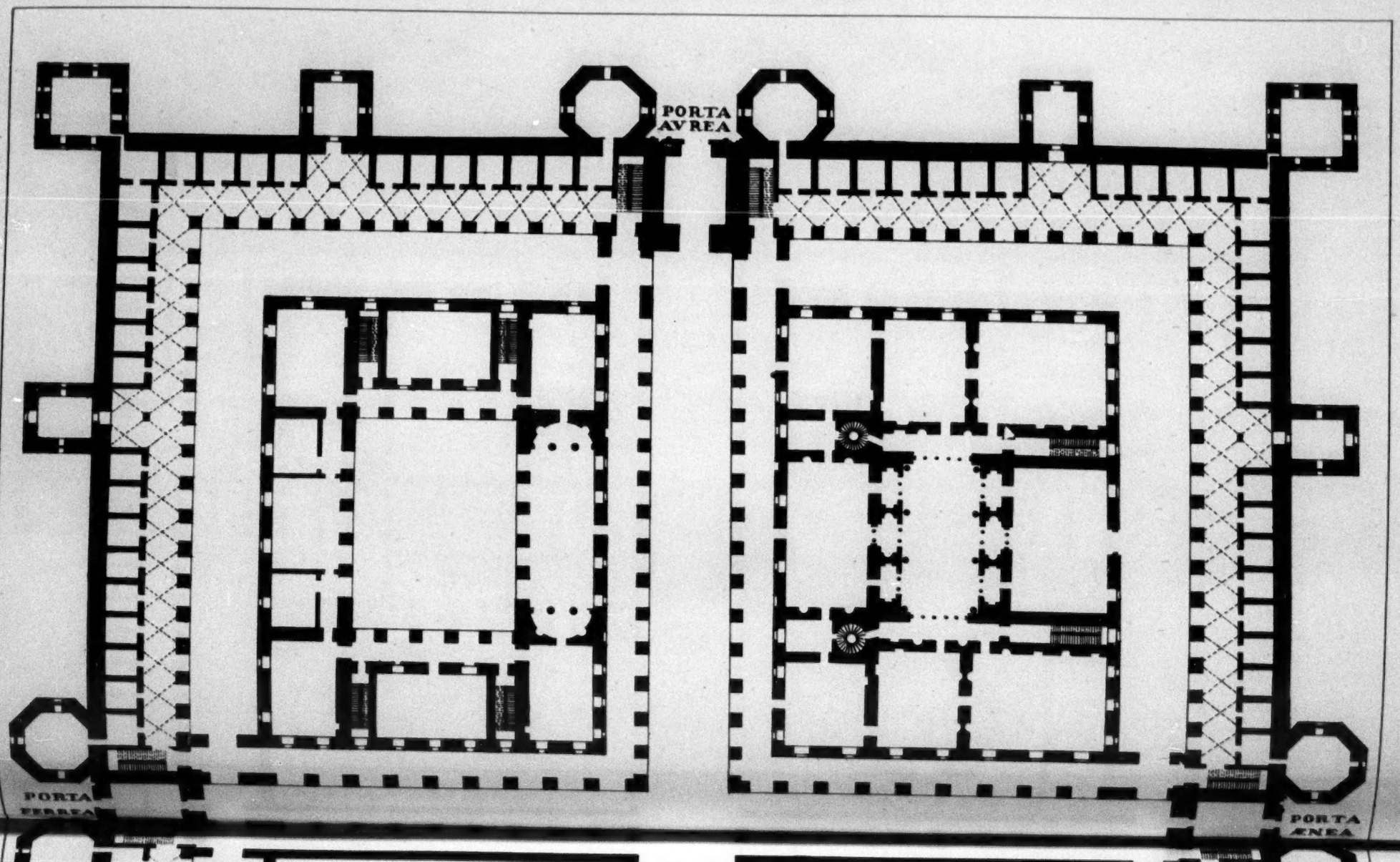


SIDE ELEVATION.

FACING MORNINGSIDE PARK.

"ARS LONGA VITA BREVIS"

R. W. GIBSON, ARCHITECT, NEW YORK.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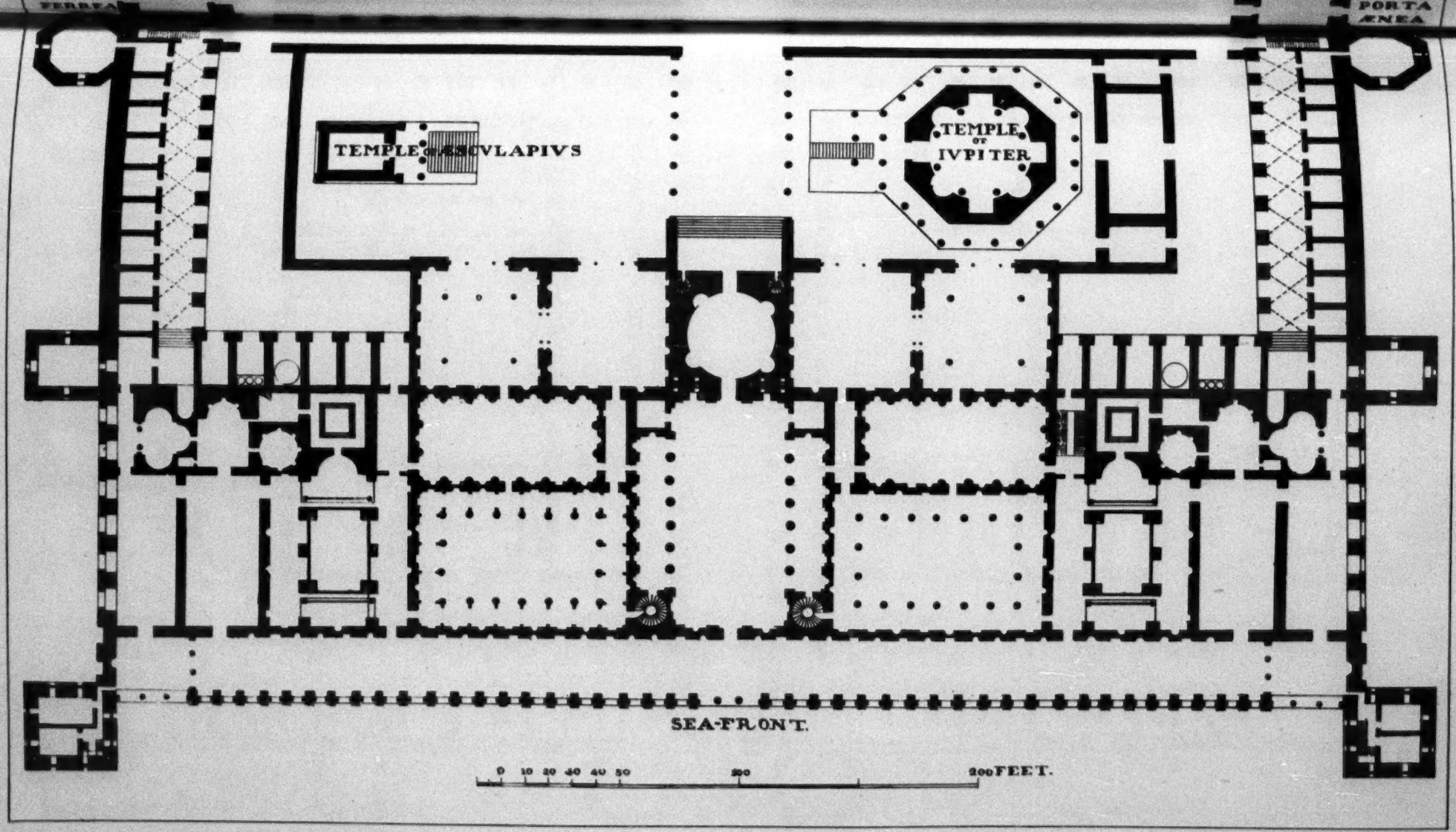


PHOTO-LITHO. SPRAGUE & CO., 32, MARTINS LANE, CANNON ST., LONDON, E.C.

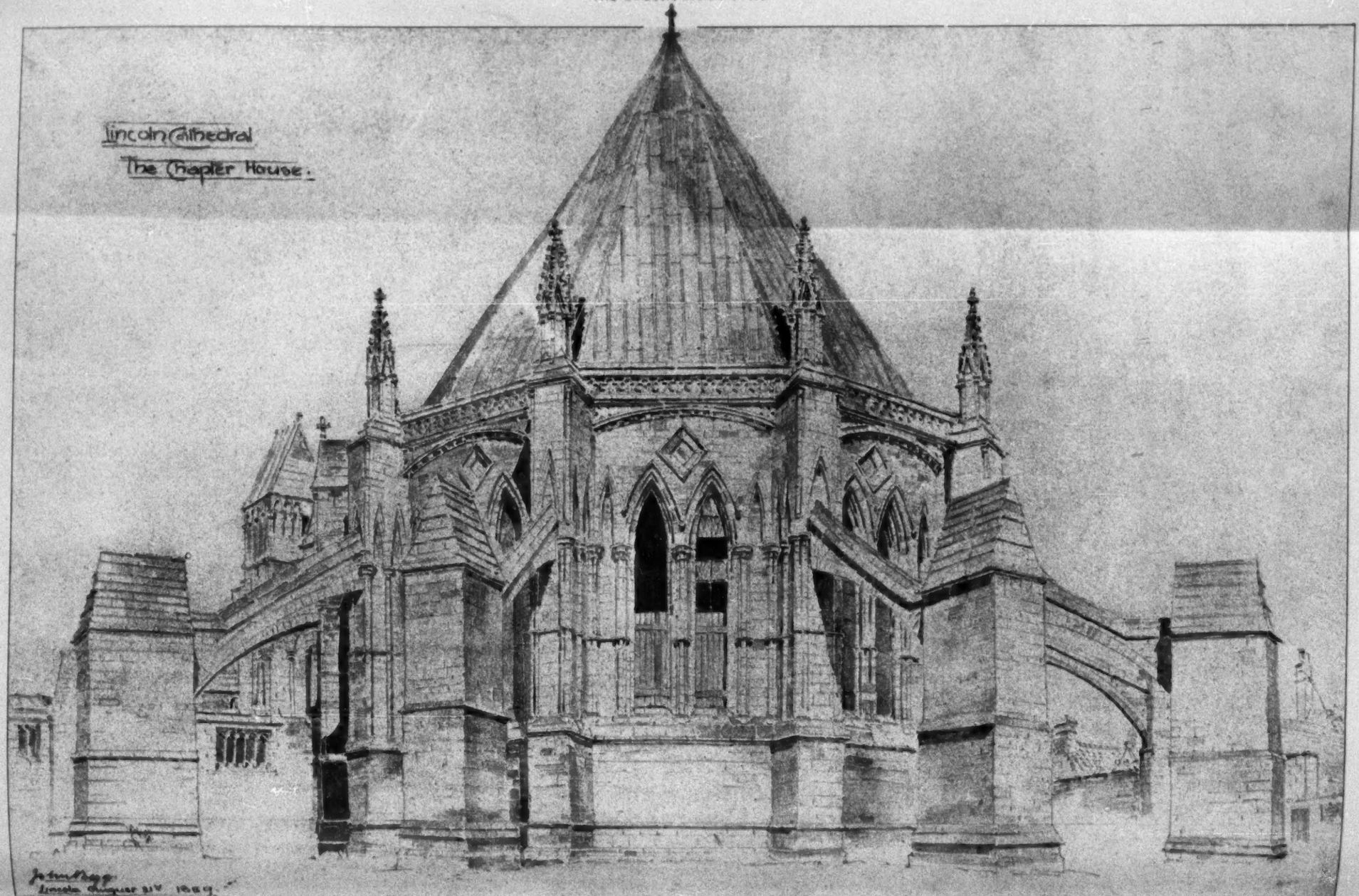
PLAN OF DIOCLETIAN'S PALACE AT SPALATO.

284-313 A.D.

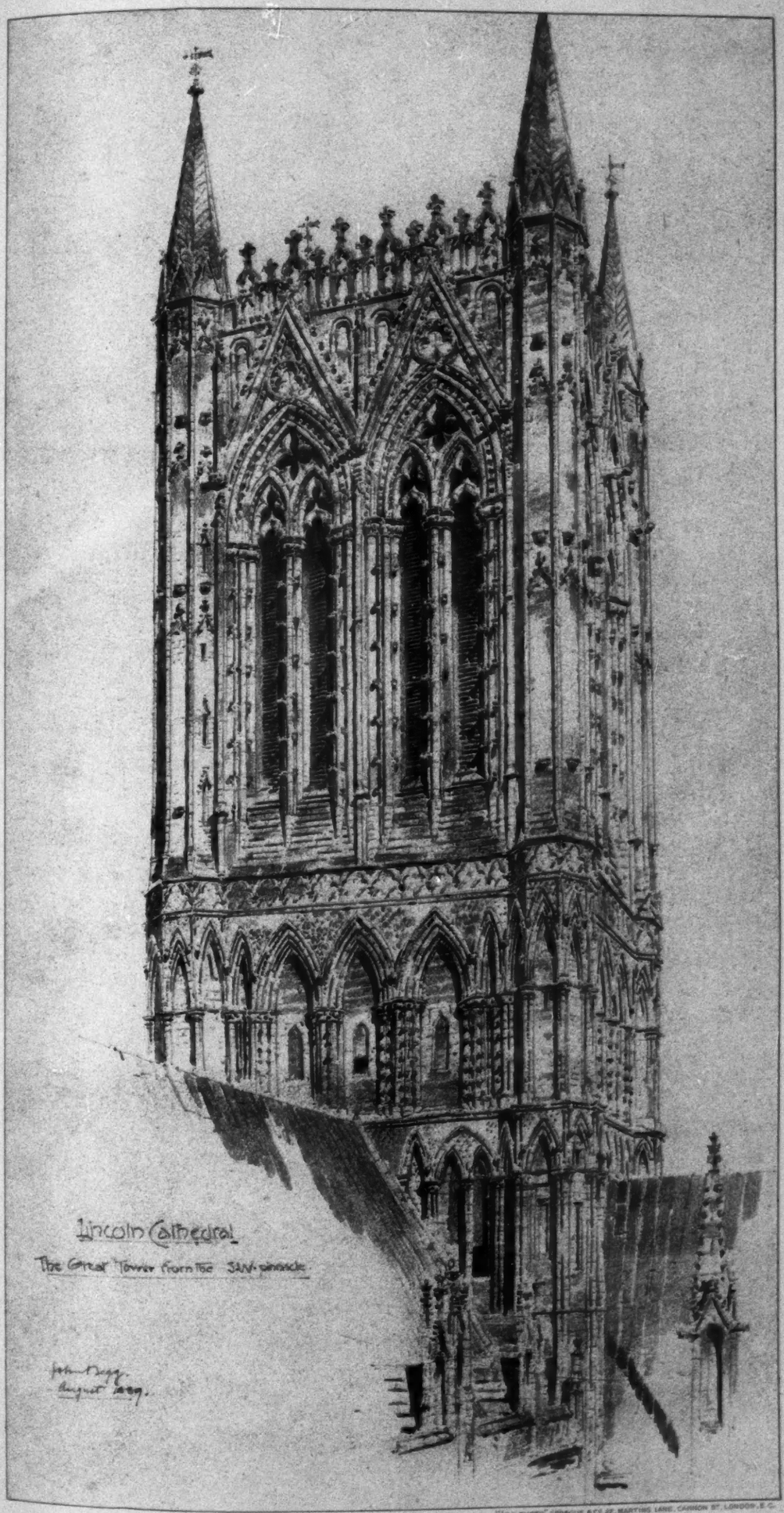
(In Illustration of Professor Aitchison's Lectures).

Lincoln Cathedral

The Chapter House.



J. Fulleylove
Lincoln August 21st 1889.



"BIRD" PHOTO." SPRAGUE & CO. 62, MARTINS LANE, CANNON ST., LONDON, E.C.

Pugin Studentship, R.I.B.A., 1890.

THE LONDON COUNTY COUNCIL.

THE usual weekly meeting of this Council was held on Tuesday afternoon in the Council Chamber of the Corporation of London, Guildhall, Lord Rosebery in the chair.

The Proposed Blackwall Tunnel.—The Bridges Committee presented the following report:—"The Thames Tunnel (Blackwall) Act, 1887, and the report of Mr. Wolfe Barry have had the most anxious and careful consideration of your Committee. For many years the people of the east and south-east of London pressed upon the Metropolitan Board of Works their claim to have provided by the central authority some means of permanent inter-communication commensurate with the important interests on both sides of the river. As far back as August, 1882, Sir Joseph Bazalgette prepared, by order of the Board, a report which deals with the whole subject, going very fully into the question of ferries, bridges, and tunnels: this report concludes with the statement that a tunnel is the only suitable means of effecting a permanent crossing at Blackwall. After much consideration, the Board took the same view. Much time was spent in preparing the details necessary before going to Parliament, and a Bill was promoted in the session of 1887. It was referred to a Committee, when the scheme, which was opposed by railway companies and other owners of property, was supported by some of the ablest engineers of the day, viz., Sir J. Bazalgette, Sir F. Bramwell, and Mr. B. Baker. The Committee reported in favour of the Bill, and it was in due course passed. Specifications were prepared and tenders advertised for, and the action of the Metropolitan Board of Works in accepting in the last month of its existence a contract for this important work, instead of leaving the Council unfettered, will be fresh in the recollection of the Council. Your Committee on taking up the matter were placed in considerable difficulty, the Council being without a Chief Engineer, and the advantage of having the same engineer to prepare the specifications and carry out a work of this character will be obvious. The technical aspect of the questions arising as to size, boring or borings, practicability of scheme, &c., were by order of the Council referred to Mr. J. Wolfe Barry, and a copy of his report has been forwarded to each member. Mr. Barry, though suggesting certain modifications, considers a tunnel practicable, but suggests a high-level bridge. Your Committee are of opinion that, as a bridge at this point would have to be of such a height as to admit of all ships passing under it without any alterations in their masts, and as ships with masts 200 ft. above the water are stated to pass at this point, the road of the bridge would have to be at least 210 ft. above Trinity High Water Mark. When the low level of the land on both sides of the river is considered, a bridge of this height is, in the opinion of your Committee, out of the question. They therefore recommend—

'(*a*) That the Council do proceed with the formation of the tunnel authorised by the Thames Tunnel (Blackwall) Act, 1887.

(*b*) That the Bridges Committee be authorised to nominate an engineer of experience in tunnelling with a pneumatic shield, to prepare the necessary plans and specifications for carrying out the works, submitting the whole to the Council.'"

The adoption of this report was moved by Mr. G. W. Osborn, Chairman of the Bridges Committee.

Mr. Arthur Arnold moved, as an amendment—

'That the Council doth disagree with the recommendation of the Committee, and is of opinion that the report of Mr. Barry should be adopted so far as it is opposed to the construction of a tunnel at Blackwall, and that the best efforts of the Council should be directed to providing such other means of communication as may appear most desirable.'

After a long discussion, in the course of which opinions strongly adverse to the tunnel scheme were quoted as having been given by Mr. Wolfe Barry, General Sir Andrew Clarke, R.E., and other engineers (not on account of engineering difficulties, but on account of the ill-chosen site of the tunnel and its necessarily long approaches), it was agreed to adjourn the further consideration of the subject to a special sitting to be held on Friday next, March 7. We may add that in the course of the discussion an extension of the ferry system, as now working at Woolwich, was advocated.

Having transacted other business, the Council adjourned.

SURVEYORSHIPS.

London (*St. Martin's-in-the-Fields*).—Mr. Charles Mason, Assoc. Inst. C.E., Assistant Borough Surveyor of Leicester, was last week unanimously elected Surveyor to the Vestry of St. Martin's-in-the-Fields, Westminster. There were eighty-five applicants for the appointment who were reduced to the following eight for the final, viz., Mr. Mason (Leicester); Mr Monson, St. James' Vestry, Westminster; Mr. Waddington, Assistant-Surveyor to the Islington Vestry; Mr. Wright, Assistant-Surveyor to the Battersea Vestry; Mr. Garthwaite, Engineer's Office, Corporation of London; Mr. Burgess, Stockton-on-Tees; Mr. Dickenson, York; and the Assistant-Surveyor, St. George's, Hanover-square.

Wimbledon.—At a meeting of the Wimbledon Local Board, held on the 19th ult., Mr. C. H. Cooper, A.M.I.C.E., Assistant-Surveyor, was appointed Surveyor, in the place of Mr William Santo Crimp, who lately obtained the Assistant-Engineership to the London County Council.

THE CENTRAL ASSOCIATION OF MASTER BUILDERS OF LONDON.

THE eighteenth annual meeting of this Association was held at the offices, 31 and 32, Bedford-street, Strand, W.C., on Wednesday, the 26th February, Mr. J. T. Chappell, President, in the chair.

The Secretary, Mr. E. S. Henshaw, read the following report:—

"The Committee have the pleasure to place before the members their Eighteenth Annual Report.

It will be remembered that at the last annual general meeting the President, Mr. Jno. T. Chappell, and the then Past-President, Mr. H. H. Bartlett, were requested to confer with the solicitor, and if considered advisable by them to take the necessary action with reference to the Classification and Schedules of Rates and Charges proposed by the railway companies under the Railway and Canal Traffic Act (1888), and lodged by them with the Board of Trade.

A Commission was appointed by the Board of Trade to hear any objections on behalf of traders to the propositions of the railway companies. As the statements prepared by the President showed that these propositions injuriously affected the building trade, the Committee employed an expert, who drew up formal objections and prepared elaborate tables, showing the enormous increase which the railway companies were asking powers to enable them to charge for the carriage of building materials and plant: in some cases the proposed increase on the present rate being as much as from 200 to 300 per cent.

In addition to the individual opposition of this Association, the Committee are also opposing the railway companies through the Mansion House United Association on railway rates.

The Board of Trade having issued a circular asking objectors and the railway companies to meet and endeavour to come to some arrangement which would be satisfactory to both parties, the Secretary met them, but without any satisfactory result.

The expenses incurred are very heavy, and a special fund has been started by the Committee to meet this increased expenditure, and the Committee trust the members of the Association will respond liberally, so that the general funds will not have to be encroached upon.

Prints of the tables prepared by the Association in support of their case, and giving much information upon the present powers of the various companies running into London, can be obtained at the office of the Association.

Early in the year the Committee had to consider the action of the London County Council (Main Drainage Committee) in proposing to fine a member of this Association 500*l.* for sub-letting brickwork. The firm alluded to attended before the London County Council, when the Engineer's report was read, and the Chairman of the Committee promised that a copy should be forwarded to the firm, and the matter has since been allowed to drop by the London County Council.

During the autumn demands were made by the navvies employed by three firms of contractors for an advance of wages of ½*d.* per hour, but on being told their demands could not be acceded to, and that any dissatisfied men could go to the office and receive their money, the men, after a short interval, resumed work.

Notices have been received from different branches of operatives in the Provinces, viz., Birmingham, Bradford, Liverpool, Leeds, Edinburgh, Bristol, &c., for a rise in the rate of wages, and other matters.

The attention of the Committee having been directed to the recent Act of Parliament for the rating of hoardings, which empowers each parish to make its own regulations, the Committee felt it was a matter that must be dealt with, in each case, by the individual affected.

The Committee have to announce that the Home Secretary has given notice of his intention to introduce into the House of Commons 'a Bill to amend and consolidate the law relating to the Liability of Employers for Injury to their Workmen.' The Committee presume that this Bill will be drafted on the lines of the Bill introduced previously, and, if passed into law, will add very much to the liability of employers. The Committee, therefore, think it right to impress upon all members of the trade the desirability of effecting insurances against these risks with the Builders' Accident Insurance, Limited.

In accordance with the rules of the Association, the President, Mr. Jno. T. Chappell, becomes an Honorary Vice-President; and four members of the Committee—viz., Messrs. Wm. Downs, John Marsland, Geo. Wall, and John Woodward, retire—Mr. Wm. Downs and Mr. Geo. Wall being eligible for re-election."

The Chairman moved that the report and accounts be received and adopted, and the resolution having been seconded was carried unanimously.

Mr. J. Howard Colls was then elected President, Mr. Downs and Mr. Geo. Wall were re-elected, and Mr. G. J. Lyall and Mr. R. Thorn were elected, members of the Committee. Messrs. G. Williams and H. S. Foster were elected auditors.

A vote of thanks to Mr. Jno. T. Chappell for his services as President for the past year concluded the proceedings, after various matters with regard to the trade had been fully discussed.

PROVIDENT INSTITUTION OF BUILDERS' FOREMEN AND CLERKS OF WORKS:

ANNUAL DINNER.

THE annual dinner of this old-established Institution was held on Saturday last, at the Holborn Restaurant, under the chairmanship of Alderman Sir James Clarke Lawrence, Bart. There were more than 300 members and friends of the Institution present. The usual loyal and patriotic toasts having been given (Mr. George Burt, jun., replying on behalf of "The Reserve Forces"),

The Chairman, in proposing the toast of the evening, "Success to the Provident Institution of Builders' Foremen and Clerks of Works," said it was hardly necessary to say a word to commend the claims of the Institution to the sympathy and support of those whom he saw around him. Was there any one present who did not know how precarious was the life of a builder's foreman or a clerk of works? Where, then, would be found a stronger desire or a deeper determination to support an institution which ministered to the needs of old and infirm members of those callings, or of their widows and families? He had been looking through the report, and one thing that struck him was the great amount of good they had been able to accomplish. He had known the Institution for a great many years, and he most cordially commended it to the support of all who were connected with the building trade. With the toast (which was warmly received) he coupled the name of Mr. J. W. H. Bedford, the honorary secretary.

Mr. Bedford, in responding, gave some particulars of the working of the Institution. He stated that a member's subscription was only 2*l.* per annum. With that limited subscription, however, they never could have done what they had during the last fifty years. They had to thank the master builders (and none more so than those who, father and sons, bore the honoured name of Lawrence), the builders' merchants, and others. The Institution now dispensed about 300*l.* a year in pensions.

Mr. Groome, in proposing "The Governor, Trustees, Donors, and Honorary Subscribers," spoke in warm terms of the great services which had been rendered to the Institution by those gentlemen, and especially by the Governor, Mr. George Plucknett, J.P., whose name was associated with the toast.

Mr. Geo. Plucknett, J.P., in responding, said that he could bear testimony to the admirable and economical way in which the affairs of the Institution were managed. There were hardly any expenses connected with its management, the officers being honorary, and doing their work well.

The Chairman next proposed "The Architects and Surveyors," who were of all men the most capable of judging of the value of the services of the clerk of works and builder's foreman. He spoke of the interest which many architects and surveyors evinced in the status and prosperity of building trade *employés*, and urged his hearers to do all they could to take advantage of the means of improved technical education now open to them. Alluding to the lectures now in course of delivery at Carpenters' Hall, he spoke in highly complimentary terms of the lecture given there a few days ago by Professor Roger Smith on "Drawing." He had never heard that subject, in relation to the needs of building artisans, so well treated of in a lecture, and he could only say that Professor Roger Smith was proving himself a worthy successor of the late Professor Donaldson in the Chair of Architecture at University College, London. As a personal matter, he (the Chairman) was proud to have been amongst the first of the late Professor Donaldson's pupils at University College, some forty years or more ago.

Mr. H. Percy Monckton, F.R.I.B.A., replied on behalf of "The Architects," and Mr. W. H. Strudwick on behalf of "The Surveyors."

Mr. Alexander Ritchie, in a humorous speech, proposed "The Builders," coupled with the name of Mr. Hall, of the firm of Hall, Beddall, & Co., successors to Messrs. William Lawrence & Sons, of which firm the Chairman was a member.

Mr. Hall, in replying, said that he was specially pleased to be allowed to speak on that occasion, for if it had not been for the magnificent liberality of Sir James Clarke Lawrence and his brothers, he

(Mr. Hall) would most probably not have been there in the capacity of a master-builder that evening.

The other toasts were "The Chairman" (proposed by Mr. Bedford), "The Press" (proposed from the chair and coupled with the name of the representative of the *Builder*), and "The Visitors," proposed by Mr. Stapleton, and coupled with the name of Mr. James Adams.

During the evening the Financial Secretary, Mr. J. Merifield, announced donations and subscriptions to the amount of between 50*l.* and 60*l.*

A CLAIM ON A BILL OF EXTRAS:

SMITH *v.* KIRK AND RANDALL.

This case, heard in the Brompton County Court on Tuesday last, was of some interest. It had been remitted from the High Court, and was a claim for 49*l.* 5*s.* 6*d.*, for goods supplied. The point raised was as to a builder's liability to pay to specially-employed tradesmen money ordered by the architect to be included in the bill of extras, and so included by the quantity surveyor.

The case arose out of the erection of the Kensington Public Baths, of which Mr. Thomas Verity was the architect, and Messrs. Kirk & Randall the builders. The plaintiffs were Messrs. C. Smith & Sons, lock manufacturers, &c.

It was shown by the evidence of Mr. Verity and of Mr. F. H. A. Hardcastle that the amount in dispute was inserted in the bill of extras, and that the amount had been paid by the Baths Commissioners to Messrs. Kirk & Randall, having been included in a lump sum of 2,500*l.* paid in final settlement of the contractors' account. That amount was arrived at on the basis of a bill of extras and variations, the items of which had been jointly agreed to by Mr. F. H. A. Hardcastle, the quantity surveyor acting on behalf of the Commissioners, and Mr. Sydney Batstone, a surveyor appointed by the builders to watch their interests in the measuring-up of the work and the final adjustment of the accounts.

For the defence it was contended that the architect had exceeded his authority under the contract.

His Honour, Judge Stonor, gave judgment in favour of the plaintiffs for the amount of their claim, with costs. He held that, in pursuance of the contract, Mr. Verity had power to order the goods, and did order them; that the amount being included in the accounts prepared by Mr. Hardcastle on behalf of the Commissioners, and Mr. Batstone on behalf of the defendants, the latter must be held to have had knowledge constructively that it was so included; and that, not having repudiated it when they agreed to a settlement with the Commissioners and gave a receipt in discharge of all claims, they were liable.

INSANITARY CONDITION OF A RESIDENCE IN WEST HAMPSTEAD.

Sir,—My attention has been directed to your "Note" in last week's *Builder* with reference to the above, and as the "independent Surveyor" who was called in permit me to say that the statement made in Mr. Tonge's letter to the *Times* of the 10th inst. was perfectly correct, and that the passage to the main drain (or sewer) was blocked at the time of my visit to the house, and, judging from the accumulation of deposit in the drain, I should say it had been blocked for a considerable time.

Chokages of this kind, under certain circumstances, can occur without being known to the tenant and without being visible at the surface, and, incredible as it may appear, on being called in to examine the drainage system of a large house in South Kensington a short time ago, in which there were two cases of typhoid fever, not only was the outlet to the sewer blocked, but the whole drain—a nine inch one—was full-up with decomposing sewage from end to end, and in addition, the soil surrounding the drain was blackened to the extent of about three feet on either side of it and from two feet to two feet six inches in depth. The pipes had been laid dry, *i.e.*, without any form of jointing material, and after the occurrence of the chokage the liquid sewage passed away into the gravel soil, and the solids remained behind, as before stated.

There was absolutely no evidence of all this on the surface, and but for the outbreak of fever the sewage might have gone on accumulating under the house to this day without the tenant being aware of it.

I am pleased to note from recent reports that the Local Sanitary Inspectors, as a body, are making a move to weed out the incompetent men from their ranks, of whom, alas! there are at present by far too many. Within the past twelve months no less than three cases similar to that of Mr. Tonge's have come under my direct notice, where Sanitary Inspectors have shown gross ignorance and incompetence in dealing with drainage matters, and this in London too, "the least badly-drained metropolis in the world."

N. P. Jasper, Assoc. M.Inst.C.E.

LECTURES FOR SANITARY INSPECTORS AT THE SANITARY INSTITUTE.

Sir,—Referring to Mr. Booker's well-meant letter in your issue of the 15th Feb., I should like to point out that hitherto the lecturers have, as a rule, deplored that the twelve or thirteen hours in all devoted to them is insufficient. It would, therefore, seem impossible to make the lectures of more extended application without seriously injuring their present special usefulness. On the other hand it seems to me that the Sanitary Institute would greatly extend its usefulness, and promote the objects which are dear to it, by granting certificates to candidates other than Sanitary Inspectors, and confining the examination of such candidates to those subjects (varying, of course, according to the offices held, or trades pursued) in which they desire to obtain certificates of sanitary knowledge and proficiency.

I put in a plea that the Sanitary Institute should grant certificates to builders who show a sufficiently perfect knowledge of the sanitary branches of their trade, without asking them to pass through the whole of the subjects special to inspectors of nuisances, many of which subjects are entirely outside the builders' sphere and trade, and which might easily be replaced by the knowledge of sanitary building construction and the model by-laws relating thereto. It seems strange, whilst the registration of plumbers, masters and men, is progressing slowly but surely, that the registered plumber is oftentimes under a master (more often than not the much-maligned builder) whose orders, whether sanitary or unsanitary, he must implicitly carry out, and yet that the master cannot obtain the Institute's sanitary certificate without coaching himself up in the multifarious duties of an inspector of nuisances.

Doubtless besides builders there are others who are desirous of obtaining the Institute's sanitary certificate, and surely the Sanitary Institute cannot better promote its objects than in creating, fostering, and satisfying the demand for such certificates which must eventually and certainly result in the diffusion of sanitary knowledge amongst all classes; until which time the Sanitary Inspector, with all his learning and perseverance, will find his hands greatly tied. Builder and Decorator.

February 19, 1890.

VALVES TO FRESH-AIR INLETS.

Sir,—I noticed in the course of his interesting and valuable lecture on "Modern Sanitation," at Carpenters' Hall, on Wednesday last, Dr. Corfield touched on the question of "valve" or "no valve" to fresh-air inlets to drains. He appears most decided in his opinion that they are useless and radically wrong, and in the course of his remarks said:—"When you find a valve on a fresh-air inlet you may depend that the man who carried out the work had not sufficient confidence in the arrangements to be certain that what he intended as an inlet would not at some time or other become an outlet."

With all due deference to Dr. Corfield's opinion, I think he is putting it rather strongly when he says this, and I would ask him whether he has sufficient confidence in any of the works he has superintended to enable him to say, "That inlet will never become an outlet"?

For my own part, I do not consider it of vital importance whether a valve is provided or not; but the fact remains that every time a good flush is sent down the drain it acts as a piston and forces the gases and air in the drain before it, and if there is no valve on the inlet that is where they will make their exit.

But, as I have just hinted, the quantity being so small, and in a properly-ventilated drain the gases having no opportunity of becoming dangerous, I do not consider a valve absolutely necessary, although I still hold that in some situations it may be desirable to prevent the exit of anything through the inlet. Therefore, I do not consider, because a man takes a precaution which in some cases may be necessary, that it shows a want of confidence in his work, for with the best design and workmanship, natural laws will at times cause the gases and air in a drain to seek to escape through the first air-inlet, and I challenge Dr. Corfield or any one else to refute this. Harry G. Assiter.

Free Lectures to Artisans at Carpenters' Hall.—The third of the present series of free lectures to artisans and others in matters connected with building, under the auspices of the Carpenters' Company, was delivered on Wednesday, the 19th ult., by Professor W. H. Corfield, M.A., M.D., his subject being "Modern Sanitation." Mr. Joseph Preston presided, and there was a large attendance. The fourth lecture of the series was delivered to a large audience on Wednesday evening last by Professor Armstrong, Ph.D., F.R.S., his subject being "The Domestic Fireplace." Mr. Charles Barry, F.S.A., F.R.I.B.A., presided. We hold over our reports of these two lectures.

The Student's Column.

ELECTRICITY, MAGNETISM, AND ELECTRICITY SUPPLY.—IX.

Magnetic Circuit.

THE rapid development of dynamo-electric machinery soon rendered it necessary that the number of lines of force or *flux* traversing any part of a machine should be determined, if possible, by methods as easy to use as Ohm's law for the determination of the current flowing in any part of an electric circuit. Electrical engineers, finding the means employed by mathematicians unsuited to their wants, have returned to and extended Faraday's way of attacking the problem.

Faraday described everything he treated with such minuteness of detail that want of space prevents our giving his ideas in his own words, but the two following quotations from his "Experimental Researches in Electricity" will show his general methods sufficiently for the purpose.

Under *Magnetic Conduction* he wrote, in 1850, "I will now endeavour to consider what the influence is which paramagnetic and diamagnetic bodies, viewed as conductors, exert upon the lines of force in a magnetic field." And again, under *Analogy between the magnet and a voltaic battery*, "The magnet with its surrounding [field of force*], may be considered as analogous in its condition to a voltaic battery immersed in water or any other electrolyte; or to a gymnotus or torpedo, at the moment when these creatures, at their own will, fill the surrounding fluid with lines of electric force." Within the last few years the idea of conceiving a magnet or helix carrying a current as a magnetic battery, and anything through which lines of force pass as a magnetic conductor, has become all but universal among electrical engineers.

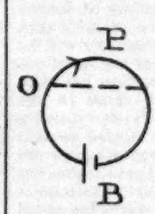


Fig. 21.

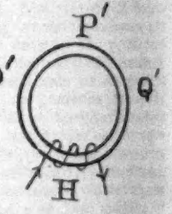


Fig. 22.

In the case of a simple electrical circuit, fig. 21, consisting of a battery B, where an E.M.F. E is driving a current through a circuit of total resistance R, if C is the current flowing, then $C = \frac{E}{R}$. Again, if between the points O and Q in the external circuit a second conductor be placed, it is easy to calculate how it will modify the resistance of the whole circuit, and also what proportion of the whole current given by the battery flows from O to Q by way of either of the two branches O P Q and O Q. When the dimensions of an electrical conductor and the specific resistance of the substance of which it is made are known, it is easy to calculate its resistance, unless mathematical difficulties are introduced owing to its shape being complex. By the specific resistance of a substance is meant:—The resistance of a cube of the substance whose edge is one centimetre in length, the direction of the current being perpendicular to a face. Under ordinary circumstances conductors are of uniform cross section. For such a conductor let:—R = the resistance, ρ = the specific resistance of the substance of which it is made, l = the length, s = the cross section, then:—

$$R = \rho \frac{l}{s} \qquad (1)$$

By the length of the conductor is meant the length measured in the direction of the current, and similarly the cross section is taken at right-angles to this direction at each point. Clearly, the resistance of a particular conductor differs according to the direction in which the current is sent through it, the resistance offered to a current by the conductor in fig. 23 is much greater when the flow is from the face A to B

* Faraday uses the expression "sphondyloid of power," the meaning of the word sphondyloid having been previously explained in a note which it does not seem necessary to reproduce here.

than when it is from P to Q. Ohm's law and its consequences, however, are too well known to need recapitulation here, and the above

Fig. 23.

facts have merely been recalled for the sake of analogy in considering the magnetic circuit.

Figs. 21 and 22 may now be compared as two very simple cases of electric and magnetic circuits; B is a voltaic cell, having a certain electro-motive force which will, if a closed path of electrical conductors lead through it, produce a current in such path whose value can be calculated by Ohm's law, if the E.M.F. of the cell and the resistance of the circuit are known. H is a helix, carrying a certain current of A amperes, and produces lines of force whose number depends upon the media through which they pass. The number of lines passing by any path is, as already stated, called the *flux* through that path, and just as a voltaic cell can, by virtue of its *electro-motive force* (E.M.F.) send a *current* through an electrical conductor, so can a helix by virtue of its *magneto-motive force* (M.M.F.) send a *flux* through a magnetic conductor.

Flux is, therefore, the analogue of current, though it must at once become apparent that a flux is a more difficult thing to control than a current. A current may be entirely stopped by placing an insulator across its path; but lines of force can go through every known substance,—there is no such thing as a magnetic insulator,—and hence the regulation of a magnetic flux presents the difficulties that would be presented by an electric current if no substance could be found to insulate a charge of electricity properly. The meanings of such expressions as electro-motive force have already been given in former articles; how those explanations can be made to apply equally well to the corresponding ones applied to magnetism may be seen by the following definition of electric and magnetic potential, it being noted that the definition applies to the "absolute" units. As the potential of the earth is unknown, and by the potential at a point is meant the difference between its potential and the earth's, difference of potential is alone defined. The difference of $\left\{\begin{matrix}\text{electric}\\\text{magnetic}\end{matrix}\right\}$ potential between two points is the number of ergs of work that would be done in moving unit $\left\{\begin{matrix}\text{quantity of positive electricity}\\\text{north pole}\end{matrix}\right\}$ from one point to the other. The various units used in the magnetic circuit have not been long enough in every-day use to have been given names corresponding to the ampere, volt, and ohm, and the expressions used are, therefore, verbose.

Various kinds of apparatus are employed for producing electro-motive force, but for the production of magneto-motive force a helix, as in fig. 22, is practically the only device used, and its M.M.F. can be readily calculated. Let A = current in amperes flowing through the helix, n = number of turns of wire and M = the M.M.F. produced:—

$$M = \frac{4\pi nA}{10} \qquad \text{(ii)}$$

The quantity nA is called the number of *ampere-turns* in the coil, for as the other parts of the expression consist of constants, the M.M.F. of a helix depends upon the ampere-turns, and not upon either the current or number of turns alone.

Ohm's law, as applied to the electric circuit, may be regarded as a definition of electrical resistance. We will, therefore, take Ohm's law and apply it to the magnetic circuit, to define magnetic resistance. In fig. 22, suppose the anchor ring, O′ P′ Q′, which forms the circuit under consideration, to be made of the best soft iron; as specimens of this metal may be taken whose specific magnetic resistance is only a few ten-thousandths that of air, we shall regard air as relatively speaking a magnetic insulator, and consider that the whole flux passes through the magnetically insulated anchor ring. Let l = mean length of ring, s = cross section. M = M.M.F. of helix.

If the ring contained air alone, the specific magnetic resistance of air being taken as 1 then F_a, the flux through the air, would be by Ohm's law:—

$$F_a = \frac{M}{\left(\frac{l}{s}\right)} \qquad \text{(iii)}$$

If, however, the air-ring is replaced by the iron-ring, whose permeability is μ, the flux F will be μ-times as great; M has not changed, hence the resistance of the circuit has fallen to $\frac{1}{\mu}$-th its former value, and

$$F = \frac{M}{\left(\frac{1}{\mu}\frac{l}{s}\right)} \qquad \text{(iv)}$$

If the expression $\left(\frac{1}{\mu}\ \frac{l}{s}\right)$ for the magnetic resistance be compared with $\left(\rho\ \frac{l}{s}\right)$ given in equation (i), it will be seen that $\frac{1}{\mu}$ is the specific magnetic resistance of the sample of iron used, so that *permeability* and *magnetic conductivity* mean the same thing.

In addition to the difficulty of applying Ohm's law to the magnetic circuit, arising from the fact that even air is a magnetic conductor, and hence that what may be called leakage of flux, corresponding to leakage of current in an imperfectly insulated electric circuit, takes place; there is the very serious difficulty that while ρ remains constant no matter what current is passing, so long as the temperature of the body remains constant, μ varies in a very complicated way with the flux, and this variation in the case of iron must next be considered.

Books.

Electric Light, its Production and Use. Embodying Plain Directions for the Treatment of Dynamo-Electric Machines, Batteries, Accumulators, and Electric Lamps. By JOHN W. URQUHART. Third edition. London: Crosby Lockwood & Son. 1890.

THE first edition of this work appeared in 1880, and although a considerable amount of new matter has since been added, it is typical of the books which used to be written about the electric light in its early days.

After giving a brief account of the first production of the voltaic arc, and defining the ordinary electrical units, the author expresses his opinion that, "As a source of electricity for permanent electric lighting the voltaic battery is, in our opinion, practically useless," and then proceeds to describe with much detail the "construction of batteries," and many of the well-known forms of cells. The accounts of the Lalande and Upward batteries, however, from which so much was at one time expected, will be read by many with interest. The descriptions of the development of accumulators give a good idea of what has been done in this direction; but the data, evidently furnished by manufacturers of secondary cells, are misleading in the extreme. Mr. Urquhart states that if a cell is discharged slowly its "efficiency" may be as high as 95 per cent. Probably the author means that 95 per cent. of the ampere-hours put into a cell can be got out again, but surely the fallacy of measuring the so-called "efficiency" of a cell by this means has been pointed out often enough.

A few words upon thermo-electric batteries bring the writer to the subject of dynamo-electric machinery. About two-thirds of the plant described is altogether antiquated, and never met with nowadays. "Antiquated" may seem a strong word to apply to apparatus that was used eight or ten years ago, but it must be remembered, so rapid has been the progress of the electric light, that dynamo-machines and lamps which were new inventions in 1880 are now wholly superseded. The hints given for the "Treatment of the Dynamo" are practical, and may be read with advantage by those likely to have charge of an electric light installation. Transformers and meters are dismissed with fifteen pages. Apparently Mr. Urquhart has never heard of the Ferranti transformer, used by the largest electricity supply company in the world, nor of the Lowrie-Hall transformer, used by all the House-to-House companies.

Among arc lamps it is almost needless to say, after the general idea which has been given of the contents of the book, that the Serrin, Duboscq, Wallace-Farmer, and other extinct varieties are all fully illustrated and described, as well as the candles of Jablochkoff, Wilde, Jamin, and others.

We sincerely trust that no young wireman will take Mr. Urquhart seriously when he states that "cotton-covered wire Nos. 12 or 14 B. W. G. is frequently used for conducting branches for groups of incandescent lamps," although it is only fair to the author to say that some of the fire insurance offices had reason to know that such acts were perpetrated before the days of the "Phœnix Rules."

Criticism on our final extract from this interesting work is unnecessary:—

"The Ferranti system employs high tension alternating currents, and as these mains are intended to be used for conveying electricity to Central London from the large generating station at Deptford, where the Ferranti system is exclusively employed, it is probable that at a pressure of over a million volts (*sic*), such a main will be utilised to convey currents to feed many thousands of lamps."

The Science of Metrology; or, Natural Weights and Measures. A Challenge to the Metric System. By the Hon. E. NOEL. London: Edward Stanford. 1889.

METROLOGY is the "science of measuring," and deals, as the author reminds us, with "measures of all sorts." The author, in challenging the advocates of the metric system, endeavours to show, in a clever and systematic manner, that, "by very little alteration and by a little amending, the existing English measures can be welded into a system scientifically as well as practically superior to the metric," and, at the end of the book, he provides tables and diagrams to completely illustrate his object. The number "ten" having only two divisors, 2 and 5, one of which gives a fraction of one-fifth, a proportion very seldom used, he argues that duodecimals are superior to decimals, and suggests how duodecimal sub-division may be applied to decimal notation. The mètre, the basic standard of length, is supposed to be the ten-millionth part of a quadrant of the meridian passing through Paris. He recommends the adoption of the earth's semi-axis as a better base to start from than a line drawn from the North Pole to Paris and prolonged to the Equator, and suggests making the standard "foot" measure the twenty-millionth part of the earth's semi-axis, *i.e.*, of the earth's polar radius, or half the polar axis on which it revolves. The most commonly-used rule in England being a 2-ft. rule, he would convert it into an "ell" rule of about 25 in. in length, and he shows how all the measures he proposes bear a definite proportion one to another, and become applicable both to surface and to cubic measure. The acre not being an exact measure of a square, he shows how by his system the standard square unit would not possess this objection, and argues that the Government, in adopting the scale of 1:500, "unwittingly forecast the coming of an improved and scientific system of measures." The real reason, we would remind him, is because to this scale one square inch practically represents an acre. He applies his system to the readings of a thermometer, barometer, geometry, and coinage. We admire his efforts to defend the duodecimal system, but we think it is not likely to be amended in the ingenious manner proposed in this interesting manual.

Theoretical Mechanics. By J. EDWARD TAYLOR, M.A. Lond. London: Longmans, Green, & Co.

THIS is an elementary book, which is designed to be "specially helpful to those who are reading on the lines of the Science and Art Department Syllabus for the elementary stage;" and to be "sufficient for the requirements of the London University Matriculation examination in this subject." In these respects the author has undoubtedly been successful.

Mr. Taylor,—who, it should be stated, is head master of the Sheffield Central Higher Grade and Science School,—begins with a chapter on motion, and goes right back to the commencement of things, starting with the most elementary propositions. This plan he follows throughout the book, and no doubt it is necessary in a work designed for beginners and those not of mature age. There is really not much to criticise in a book of this description. The author does not attempt any literary embellishment.

We meet with the old familiar examples by which mechanical propositions are usually illustrated, a good feature being the examples for exercise at the end of the chapters.

The Ancient Laws of Wales. Viewed especially in regard to the light they throw upon the origin of some English institutions. By the late HUBERT LEWIS, B.A. Edited by J. E. Lloyd, M.A. London: Elliot Stock. 1889.

THIS is a work full of information, and marked by much erudition; but it is impossible for us to notice it in detail, as it is scarcely within the scope of this journal. It is a book which is, however, deserving of notice, because it is one of that class which, while it is of historic and permanent value, does not meet with that popular reception which much more ephemeral works receive. Here is an extract which will exemplify the character of the work: "There is good reason to believe that one sense in which the word 'maenor' was used was that of a castle or superior mansion, wholly or partially of stone or brick, or having a stone or brick wall enclosing its precinta" (p. 141). A few pages further it is shown that the maenor or "manerium," the manor, became synonymous with the district around the Castle. In this way we trace the English manor of the Middle Ages to a British origin. Hitherto legal writers have given the derivation of manor as the Latin word *manendo*, or the French *mesner*. This is merely fancy, and in the book before us we seem to have the true derivation. The fact is that the authoritative writers on English law, such as Coke and Blackstone, are of little weight in regard to many points, which can only be elucidated by writers who will treat the subject in a scientific manner.

How to Appeal against Your Rates in the Metropolis. By A. D. LAWRIE, Barrister. Second Edition. 1890.

THIS is a convenient little handbook. We should, however, scarcely notice the second edition of so small a work were it not that we are nearing the time for the quinquennial valuation of the metropolis. While, however, the procedure in regard to rating appeals in London and the general principles of rating are clearly and shortly stated, we should not recommend any one to go very far in an appeal without competent professional advice. On the other hand, a person reading this work will be in a better position to consider whether or not he shall rest satisfied with the manner in which his property is assessed.

RECENT PATENTS.

ABSTRACTS OF SPECIFICATIONS.

1,577, Sliding Windows. A. F. M. Youlten.

According to this invention, near the top of the inner face of the sash-stile of the bottom sash, as convenient, there are affixed plates containing slots, and to the frame of the window are attached hook-plates, or *vice versâ*, or sliding-pins or pivots are fixed, and when any of the improved methods of fixing or swinging the sashes are adopted, the sash (after temporarily removing the inside beads) and raising it to the height required, may be swung inwards from the bottom for outside cleaning from within the room. Into each face of the outside lining opposite the side of the frame at any convenient height is placed a projecting screw or pivot as an axis upon which the top sash may turn inwards by means of projecting hooks, affixed to the top-rail or outside face of sash-stiles, the parting-beads having been temporarily removed or hinged back flush with the pulley-stiles.

2,798, Mixing Concrete. J. Stansfield.

In a revolving circular pan or vessel similar to a pug-mill the material is mixed; but by this invention an addition is made to the ordinary mechanism in the shape of plates formed and curved like a ploughshare. The revolution of the pan forces the concrete against the plates, which turn it over and mix it.

2,862, Improvements in Water-closets. C. W. Durham (New York).

According to this invention, the lower portion of the water-closet bowl or pan is fitted with a screw-thread, which enables it to be fixed in the pipe itself with or without an intervening trap of S or half S form.

4,946, Bricks. R. R. Clunis.

The improvement which is the subject of this patent consists in forming a series of studs or projecting pieces on one side, while upon the opposite side a corresponding number of indents are made. These studs and indents are so arranged that the studs of one course will fit into the indents of the next in order, according to any determined bond, so that a complete tie may be secured. Very little mortar is required, and the expense of manufacture is not greater than that of ordinary pressed brick.

4,947, Drain-pipe Joints. R. R. Clunis.

By this invention an inward bevel is formed around the edge of the socket at one end of the pipe section, and a flange or collar is fixed at the other end of the pipe, the end of the pipe being roughly bevelled. The cementing material being roughly laid therein, the flanged end of the pipe next in order is forced therein until the bevelled end of the pipe comes in contact with the pipe end inside the socket, the shoulder comes in contact with the outer edge of the socket, and the expressed cement being cut off by the bevels a complete and closed joint is made.

19,744, Decorating Tiles, Bricks, &c. G. A. Marsden.

According to this invention, lace or such like textile fabrics are put into the mould from which the brick or tile is made, or stencils or similar means are used, to produce a raised or indented surface; this gives a design in relief or intaglio to the face of the bricks or tiles.

NEW APPLICATIONS FOR PATENTS.

Feb. 11.—2,169, W. Barnes, Joiners' Cramp.—2,190, E. Jobson, Open Stoves or Fire-grates.—2,223 and 2,224, J. E. Rendle, Glass Roofing.—2,230, H. Lake, Excavators and Elevators.—2,233, H. Lake, Window Sashes and Frames.—2,240, H. Loftie, Wood Augers.

Feb. 12.—2,256, J. Robbins, Water-pipes, &c.—2,259, M. Chapman, Double-action Lock.—2,263, W. Heywood, Glazing and Roofing Buildings.

Feb. 13.—2,320, S. Denison and Others, Tile and Brick-pressing Machines.—2,321, S. Denison and Others, Brick-pressing Machines.—2,323, F. Bosshardt, Gabled Roofs.—2,346, T. Kemp, Testing Drains.—2,371, C. Edwards, Manufacture of certain kinds of Brick and Fire-clay Substitutes.—2,387, J. Pollock, Window-sash Regulator.

Feb. 14.—2,394, B. Field and F. Andrew, Door-knobs, &c.—2,397, W. Blackband and H. Lunn, Securing Door and other Knobs to Spindles.—2,400, T. Helliwell, Glazing Bar or Astragal for Supporting Sheets of Glass, Zinc, &c.—2,445, A. Osborne, Heads of Screws.

Feb. 15.—2,473, J. Bennison, Chimneys or Flues of Fireplaces.—2,508, B. Westerdahl, Plasterers' Lathing.—2,509, J. Guttmann, Stocks for Boring-bits.

PROVISIONAL SPECIFICATIONS ACCEPTED.

16,016, D. Knowles and E. Raybone, Sash Fasteners.—19,825, G. Verity and J. Thomas, Raising and Lowering Sliding Doors.—20,175, B. Pybus, Door Closing Apparatus.—20,518, W. Eckersley, Water Waste Prevention Cisterns for W.C.'s.—20,814, J. Tudberry, Drying Bricks.—137, J. Lyon, Glazing Greenhouses, &c.—311, S. Rogers, Water Waste Preventer and Regulator.—723, W. Thompson, Window Fasteners.—746, F. Fawthrop, Sash Bars and Glazing Holding Devices for Roofs, &c.—949, C. Sziklai, Fastenings for Doors.—974, E. Ingham, Draught Preventers for Doors.—1,020, T. Reed, Water Taps.—1,115, N. Proctor and others, Brick-making Machines.—1,151, C. Denbeigh, Window Sashes.—1,176, W. Sinclair, Cementing Iron Rails to Stone Kerbing, &c.—1,178, W. Sinclair, Water-proofing and Preserving Composition for Stone.—1,190, H. Lake, Valves for Flushing Tanks and Cisterns.—1,346, W. Sugg, Ventilating.—1,578, R. Jewell, Fire Grates.—1,639, A. Deydon, Stove.—1,654, M. Fanington, Lime.—1,671, W. Curtis, Window Sash Fasteners, &c.—1,678, C. Sansom, Fire-grates or Stoves.—1,755, A. Tomkins, Slow Combustion Stoves.—1,760, J. Taylor Ventilators, Cowls, &c.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to Opposition for Two Months.

2,688, W. Defries and N. Feeney, Hinges.—5,748, J. Willing, Fixing Letters and Devices to Facias, &c.—5,790, W. Emden, Drain-pipe Joints.—6,310, J. Sibson, Tombstones, &c.—15,854, W. Thompson, Grinding Machines for Frame and other Saws.—16,519, W. Minns, Cutting Window lead for Glaziers' use in the manner of Stained-glass Windows.—20,712, B. White and A. Boyd, Brick-making Machines.—256, A. Halliday, Saw-sharpening Machines.—671, A. Clark, Cutting Stone.—675, C. Stilwell and A. Thayer, Square and Level.

Value of Land at Cricklewood.—On Monday evening last Messrs. Baker & Sons, of Queen Victoria-street, held a sale of freehold building land, known as the "Oaklands Park Estate," opposite the "Crown" Hotel, Cricklewood. We understand that the whole of the plots offered were sold, at a total of 7,000*l.*, being at the rate of about 3,000*l.* per acre.

RECENT SALES OF PROPERTY.

ESTATE EXCHANGE REPORT.

FEB. 17.—By G. A. WILKINSON.

Portland-place — No. 11, called "Langham House," *f.* £14,700

By ROGERS, CHAPMAN, & THOMAS.

Belgravia—10, Lower Belgrave-street, u.t. 21 yrs., g.r. £20, r. £130 p.a. 1,000
Battersea—7, 8, 9, 16, and 17, Little Europa-pl., u.t. 60 yrs., g.r. £20. 12s., r. £91 p.a. 325
Kennington—35, Durham-st., c., r. £22 p.a. 185
Pimlico—8, Denbigh-pl., u.t. 40 yrs., g.r. £8., r. £65 600

FEB. 18.—By B. BROWN.

Peckham—F.g.r. of £21, with reversion in 20 yrs. 700
Battersea—F.g.r. of £14, with reversion in 62 yrs. 205
Poplar—F.g.r. of £19. 14s. 6d., with reversion at Michaelmas to £90 p.a. 310
Rotherhithe—"The Princes Dry Dock," u.t. 65 yrs., g.r. £350 700
Custom House, E.—3, Freemasons-rd., F., r. £35 p.a. 1,405

FEB. 19.—By HOBSON, RICHARDS, & CO.

Brondesbury—8, The Avenue, u.t. 85 yrs., g.r. £12 100
Wandsworth—91, Haldon-rd., u.t. 87 yrs., g.r. £6, r. £32 225

FEB. 20.—By RUSHWORTH & STEVENS.

Pimlico—81, 83, and 85, Winchester-st., u.t. 28 yrs., g.r. £30, r. £180 p.a. 1,300
28, Westmoreland-pl., u.t. 44 yrs., g.r. £8, r. £55 p.a. 440

By C. W. MILLAR.

Shepherd's Bush—28 and 30, Loftus-rd., u.t. 74 yrs., g.r. £13, r. £64 430
5 and 7, Richmond-rd., u.t. 74 yrs., g.r. £14, r. £107. 18s. p.a. 450
Ashford—1, Gloucester Villas, u.t. 75 yrs., g.r. £4, r. £24 p.a. 220

By NEWBON & HARDING.

Tottenham—F.g.r. of £72 p.a., with reversion in 88 yrs. 1,425
Islington—F.g.r. of £44 p.a., with reversion in 52 yrs. 1,020
F.g.r. of £23 p.a., with reversion in 52 yrs. 700
F.g.r. of £20 p.a., with reversion in 36 yrs. 550

By BLISS & SONS.

Bethnal-green—44, 46, 48, and 50, u.t. 14 yrs., g.r. £10, r. £113. 2s. p.a. 225
Hackney—21, Navarino-rd., u.t. 65 yrs., g.r. 49, e.r. £38 p.a. 260
5, Bayford-st., u.t. 81 yrs., g.r. £5, r. £33. 10s. p.a. 240

By G. GOULDSMITH, SON, & CO.

Hatton-garden—2, Greville-st., f., r. £65 p.a. 1,050
Clerkenwell—42, Rawstorne-st., and 13 and 14, Buxton-st., u.t. 7 yrs., g.r. £7, r. £44. 4s. 110

By E. CHRISTIAN.

Forest-gate—36, Dames-rd., f., e.r. £31. 4s. p.a. .. 315

By JENKINS, SONS, & ELLIS.

Lewisham—172, Lewisham High-road, u.t. 30 yrs., g.r. £9. 6s., e.r. £70 165
Peckham—7, Lausanne-rd., f. 450

FEB. 21.—By J. P. HOPE.

Walham Green—96 to 102 (even), Harwood-rd., u.t. 98 yrs., g.r. £29. 12s. 1,750

By SMITH & FORD.

Hornsey-rd.—12, Harvest-mews, u.t. 58 yrs., g.r. £8. 10s. 80

By GREEN & SON.

Upper Thames-st.—5, Old Swan-lane, u.t. 26 yrs., g.r. £35, r. £190 950
Hackney—54 and 56, Ash-grove, and 99 and 99, Sheep-st., u.t. 36 yrs., g.r. £6. 10s., r. £111. 12s. 405

By E. SMITH & CO.

City of London—52 and 54, Cannon-st., u.t. 41 yrs., g.r. £84, r. £675 3,400
Regent's-pk.—22, Ulster-pl., u.t. 33 yrs., g.r. £5, r. £142 p.a. 1,700

By HUMBERT, SON, & FLINT.

Holloway—27, Cottenham-rd., u.t. 75 yrs., g.r. £6. 6s., r. £42 225

[*Contractions used in these lists.*—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; e.r. for estimated rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; yd. for yard, &c.]

MEETINGS.

SATURDAY, MARCH 1.

Association of Public Sanitary Inspectors.—Mr. B. Richards on "The Removal and Disposal of House Refuse in London." 6 p.m.

Royal Institution.—The Right Hon. Lord Rayleigh, M.A., F.R.S., on "Electricity and Magnetism." III. 3 p.m.

MONDAY, MARCH 3.

Royal Institute of British Architects.—Special general meeting for members only; followed by a business general meeting for members only, to continue the discussion of Mr. John Slater's paper on "Building Legislation." 8 p.m.

Royal Academy.—Professor J. H. Middleton on "Florentine Sculpture in the Fourteenth and Fifteenth Centuries." II. 8 p.m.

Society of Engineers.—Mr. R. H. Tweddell on "The Application of Water Pressure to Machine Tools and Appliances." 7.30 p.m.

Royal Institution. — General Monthly Meeting. 3 p.m.

Clerks of Works' Association (Carpenters' Hall). — Mr. T. Edmond on "Lighthouse Construction." 8 p.m.

Liverpool Architectural Society.—Mr. J. M. Hay on "The Decorative Panels of St. George's Hall." 7 p.m.

Leeds and Yorkshire Architectural Society. — Mr. R. Macartney, B.A., on "The Revival of Applied Art." 7.30 p.m.

TUESDAY, MARCH 4.

Institution of Civil Engineers.—(1) Mr. C. O. Burge on "The Hawkesbury Bridge, New South Wales." (2) Mr. F. T. G. Walton on "The Construction of the Dufferin Bridge over the Ganges at Benares." (3) Mr. G. E. W. Cruttwell on "The New Blackfriars Bridge on the London, Chatham, and Dover Railway." 8 p.m.

Sanitary Institute (Lectures for Sanitary Inspectors).—Professor W. H. Corfield, M.A., on "Sanitary Appliances." 8 p.m.

Society of Biblical Archæology.—(1) Dr. J. H. Gladstone, F.R.S., on "The Bronze and Copper of Ancient Egypt and Assyria." (2) Mr. E. B. Taylor, F.R.S., on "The Winged Figures of the Assyrian Monuments and the Artificial Fertilisation of the Date-Palm." 8 p.m.

Builders' Clerks' Benevolent Institution. — Annual General Meeting. 7.30 p.m.

Glasgow Architectural Association.—Annual General Business Meeting.

WEDNESDAY, MARCH 5.

British Archæological Association.—Mr. J. Romilly Allen, F.S.A. (Scot.), on "The Early Sculptured Stones of the West Riding of Yorkshire." 8 p.m.

Five Lectures to Artisans and others on Matters Connected with Building.—Professor A. B. W. Kennedy on "The Forth Bridge." Carpenters' Hall, London-wall. 8 p.m.

Civil and Mechanical Engineers' Society. — Mr. E. Lucas on "Fresco Cement." 7 p.m.

Surveyors' and Auctioneers' Clerks' Provident Association.—Annual General Meeting.—Auction Mart, Token-house-yard. 6.30 p.m.

Society of Arts.—Mr. J. Trippiin on "Recent Progress in British Watch and Clock Making." 8 p.m.

THURSDAY, MARCH 6.

Royal Archæological Institute.—(1) Mr. J. P. Harrison on "Anglo-Norman Ornament Compared with Designs in Anglo-Saxon MSS." (2) Mr. A. Oliver on "A Brass at Newcastle." 4 p.m.

Liverpool Architectural Society.—A dinner will be given at the "Bear's Paw," Lord-street. 6.30 p.m.

FRIDAY, MARCH 7.

Royal Academy.—Professor J. H. Middleton on "Florentine Sculpture in the Fourteenth and Fifteenth Centuries." III. 8 p.m.

Sanitary Institute (Lectures for Sanitary Inspectors).—Mr. C. Jones on "Scavenging, Disposal of Refuse and Sewage." 8 p.m.

SATURDAY, MARCH 8.

Royal Institution.—The Right Hon. Lord Rayleigh, M.A., F.R.S., on "Electricity and Magnetism." IV. 3 p.m.

Edinburgh Architectural Association.—Visit to Free Library and Old University Buildings.

Miscellanea.

Competitions: Germany.—Looking at the list of competitions decided during the last fortnight, we find that the one at Langensalza for a new school-house (with eighteen large class-rooms), which had enticed as many as one hundred architects to compete, has been won by Herr Reg.-Baumeister F. Wendorff, who is at present attached to the staff of a well-known Imperial "Bauburean" at Leipsic. This is the third time,* and in quick succession, that this artist, who may well be termed a "school specialist," has come out first in competitions for this class of buildings, and that in spite of the large number of rivals. Twenty-two designs were sent in for the new Trinity Church at Dresden; here, as at Strasburg,† the jury did not consider themselves entitled to award the first prize. The second one (£100) was won by Messrs. Abesser & Kröger of Berlin, and the third (£50) by Herr Schramm of Dresden.

Workmen's Barracks.—On the works for the Baltic Canal, now being executed in North Germany, the unmarried workmen are required to live in barrack-huts especially erected for them. These are all built under Government control and supervision. They are constructed of timber, boarded inside and out. The minimum cube contents per bed was fixed by the Government Sanitary Department at 12 cubic mètres. The apartments are in all cases warmed and ventilated, and latrines are placed so as to be accessible to the living-rooms and dormitories, but not in contact with them; they must be supplied with water. The cost of each barrack-dormitory for 100 workpeople is approximately 700*l.*; living-rooms, dining-hall, and premises for staff, 1,000*l.*; canteen, 90*l.*; latrine, 50*l.*; door-keeper's hut, 15*l.*; and dust-hole, 12*l.* 10*s.* There are also two hospitals, each with twenty beds.

* Emden and Mannheim, both times first prize.
† See *Builder*, Feb. 15 last.

Public Works in New York.—The report of Mr. T. F. Gilroy, Commissioner of Public Works of New York, states that 4,353,000 dols. were expended during 1889. In extending and improving the distribution of water, 18·93 miles of additional water mains were laid. The system for distributing the water supply of New York now includes 657·19 miles of mains, with 6,760 stopcocks and 8,420 fire hydrants. During the year, 1,659 additional water meters were placed, making a total of 19,870 now in use. The average daily consumption of water through meters is 37,483,300 gallons. Work is in progress for a canal and tunnel to divert the water of the Byram River into the Bronx River, by which the water supply from that source will be increased by 6,000,000 gallons a day. In the extension and improvement of the New York sewerage system, 28,279 lineal feet of sewers, 1,274 lineal feet of culverts, and forty-six receiving basins were constructed, and the sewerage system on Manhattan Island now comprises 433·73 miles of sewers, with 5,209 receiving basins.

Public Works Officials, Berlin.—All officials attached to or under the control of the Architectural, Surveying, Civil and Railway Engineering, and the Administrative Departments of the Prussian Ministry of Public Works have received notice that they will henceforth be required to wear uniform on all official occasions; and the new designs for the uniforms have been published. The "order" distinguishes "gala uniform" and "ordinary service uniform," the former requiring the old Brandenburg frock-coat, white cashmere trousers and waistcoat, cocked hat, and a light sword in white leather sheath. The "service uniform" will resemble the attire worn by the German officers of line regiments, barring that dark grey trousers will take the place of blue ones, and that a sword of the old pattern will be worn in a black leather sheath. Members of the architectural department can be recognised by a cocarde containing a triangle, compass, and plumb-line, surmounted by a crown.

Berlin Town-hall.—The large assembly-room of the Berlin Town-hall has, owing to the great number of evenings it has been used since its erection, and also partly in consequence of the fire that occurred at the Red Cross Bazaar last December, been so blackened with dust and soot that the Committee in charge have proposed an entire cleansing and redecoration of the interior. Owing to want of funds, the hall has in reality never been properly completed, and it is now proposed that the original ideas of the architect (Baurath Waesemann) should be carried out, and, besides the redecoration proper, that the walls should be adorned with frescoes referring to Berlin life (after the sketches of Prof. August v. Heyden). Baurath Blankenstein, the City Architect, who is professional adviser to the Committee, strongly recommends the electric lighting of the assembly-room, and also some alterations in the hot-water coils. He estimates the total cost of the proposed improvements at 2,400*l.*

Oundle Sewerage.—The Commissioners of Oundle held a special meeting on the 17th ult. to consider plans submitted by Mr. W. H. Radford, C.E., of Nottingham, for the sewage disposal of the town. The engineer explained that he proposed to purify the sewage in duplicate precipitation and filtration tanks, the chemicals and filtering medium being supplied by the International Sewage Purification Company. The sewage mud would be pumped on to air-drying pits by means of a small circular windmill. The whole of the town sewage would be delivered to this site by various new pipe-sewers, the sewage of one low-lying locality being pumped into a high-level sewer by a small compressed-air pump placed under the street and supplied with compressed air through a pipe from the new waterworks engine. The Commissioners decided to carry out the scheme in its entirety.

Trade Smoking Concert.—The Mutual Cycling Club (in connection with Messrs. Colls & Sons' office staff) gave a very successful smoking concert at the Surrey Masonic Hall on February 20. Mr. J. Howard Colls occupied the chair, supported by Mr. William Colls, Mr. Ellis Marsland, and a large number of visitors connected with the building trade.

The Norwegian Pottery Industry.—The Norwegian pottery industry—a new one—is progressing, there being exported last year 45,000 kilos, against 26,000 kilos in 1888. Most of the manufacture is sold in this country.

Edinburgh Architectural Association.—A meeting of the Edinburgh Architectural Association was held on the 20th ult., in the hall, 42, George-street, Professor Baldwin Brown in the chair. Mr. Henry F. Kerr read a paper on "Ingress and Egress for Public Buildings," a subject which, he said, had only in recent years met with any serious and sustained consideration. To render panic among an audience impossible or innocuous, he emphasised the necessity of passages, staircases, and doors being of such ample width as to allow the building to be emptied speedily. All exits should be always used, and individually they should be of such capacity as to visibly recommend themselves to the audience. The Glasgow scheme of enlarging the exits for the upper floors was, Mr. Kerr thought, to be recommended. A plurality of exits for each block should in all cases be insisted on, and the exit capacity of the seat rows should also be attended to. Stairs for ascent and descent ought not to be of less width than the corridors between them and the auditorium, or wider than the corridors between them and the exterior. They should be provided with a hand-rail on both sides, and where six or more feet in width should also have a hand-rail in the centre. The straight stair was open to objection if of any length, the square and the newel square,—when doubled on itself,—being the safest forms. It was desirable always, in the interests of safety, to reduce the number of steps required for access to the various parts of a building, as the danger was generally speaking in proportion to the number of steps to be traversed. Hence the object in sinking the pit in theatres below the street-level, to reduce the height from the street to the gallery, and hence also the merit of Mr. Tarver's plan, which placed the gallery outlets at the level of the lowest seats in place of at the level of the highest. He recommended that all exit doors should be conspicuously marked as such, so that the audience might not use a door which did not lead to the outside of the building. Doors should open outward or swing either way, and should not be secured except by some fastening which yielded automatically to pressure from within. Corridors and stairs should be kept clear of all obstructions, barriers being rarely if ever admissible. Mr. Kerr was cordially thanked for his paper, which was illustrated by plans, diagrams, and models.

The Plumbers' Company and the Education and Registration of Plumbers.—We understand that the freedom of the Plumbers' Company has been conferred upon Mr. Edward James Jarvis, operative plumber, of Plymouth, on account of his having passed the Company's Examination in Honours.——On the 19th ult. a deputation of the Governors of the University College for North Wales waited upon the Court of the Plumbers' Company at the Guildhall for the purpose of explaining their system of technical education, and urging the claims of their institution. The deputation, which consisted of Mr. Rathbone, M.P., Mr. Roberts, M.P., Mr. Lewis, M.P., Mr. Darbishire, B.A., J.P. (London University), and Prof. Gray, was introduced by the Right Hon. G. Osborne Morgan, M.P., Vice-President. Mr. Morgan, in addressing the Court, said it was hoped that some of the aid the Company had so generously extended to struggling institutions would be bestowed upon their College at Bangor, which devoted all its energies to promoting thoroughly scientific and technical instruction, and, during its five years' existence, had established branches in all the principal towns of North Wales. Prof. Gray gave details of the work done by the College, and the public support accorded thereto. Mr. Rathbone and Mr. Darbishire also addressed the Court. The Master of the Plumbers' Company (Mr. W. H. Bishop), in reply, said he could only say that the Company's resources were taxed to the utmost, and the Court were therefore unable to offer any immediate financial assistance; but they would consider what steps might best be taken to include the University College for North Wales in their scheme now in course of preparation, by which the necessary funds might be provided for carrying out a complete educational system in all parts of the kingdom.

Black Granite.—Black granite is now being quarried on the lake Vettern, in Sweden, which is then cut and polished into various architectural ornaments at Varberg, whence they are exported to England, Germany, Denmark, &c. The stone is very handsome when polished. Some 100 men are employed here.

British Archæological Association.—The last meeting was held on Wednesday, Feb. 19, Mr. J. W. Grover, F.S.A., in the chair. A curious example of bookbinding, formed of an ancient illuminated MS. on a sixteenth-century book, was exhibited by Mr. Loftus Brock, F.S.A. Mr. A. Oliver produced a rubbing of the remarkable brass in the possession of the Surrey Archæological Society, supposed to have been brought from Netley Abbey. Two figures are represented on it,—the field being occupied by a diaper of cressets in flame. Mr. C. H. Compton pointed out reasons for discrediting the belief that the cressets were intended for the badge of the Compton family, as had been supposed. Mr. G. R. Wright, F.S.A., read a description of the cresset stone in the recently-destroyed church at Lewanick, Cornwall. It consists of a circular granite cap in which are holes for seven candles. References were given to many other similar objects, while their use was attested by quotation from the Record of Durham. A paper was then read by Mr. G. Patrick on the antiquities of Wandsworth.

Royal Victoria Hall, Waterloo Bridge-road, S.E.—The following science lectures will be given at the above Hall during March:—March 4, "Geology in the Streets of London," by Mr. F. W. Rudler. March 11, "The Infinitely Great and the Infinitely Little," by Dr. Dallinger. March 18, "Australia," by Prof. Beare. March 25, "Rome," by Mr. W. North.

New Post-Office, Geneva.—A new chief post-office is to be erected on the site in the Rue de Montblanc acquired some time ago for this purpose by the Postal authorities. The cost of the building, which is to be carried out in accordance with the designs of the Brothers Camoletti, is estimated at 1,500,000 francs, or nearly 60,000*l.*

The Stockholm Building Trade.—Last year 188 new houses were erected in Stockholm, containing 7,196 rooms, of which 104 were passed by the City Building Board. In 1888 the number of new houses was 128, with 4,746 rooms, of which 123 were passed. This shows a great falling-off in building operations in late years.

Royal Society of Painter-Etchers.—The following gentlemen have been elected *Associates* of this Society,—viz., Messrs. A. W. Bayes, W. Boucher, C. F. Robinson, and F. S. Walker.

PRICES CURRENT OF MATERIALS.

TIMBER.	£. s. d.	£. s. d.
Greenheart, B.G. ....ton	7 0 0	7 15 0
Teak, E.I. ....load	12 0 0	14 0 0
Sequoia, U.S. ....foot cube	0 2 3	0 3 0
Ash, Canada ....load	3 0 0	4 5 0
Birch ,, ...load	3 0 0	4 15 0
Elm ,, ...load	3 10 0	4 15 0
Fir, Dantsic, &c. ....load	2 0 0	3 10 0
Oak ,, ...load	2 10 0	4 10 0
Canada ....load	5 10 0	7 0 0
Pine, Canada red ....load	2 10 0	3 10 0
,, yellow ....load	3 0 0	5 5 0
Lath, Dantsic ....fathom	4 10 0	5 10 0
St. Petersburg ....fathom	5 0 0	6 10 0
Wainscot, Riga, &c. ....log	0 0 0	0 0 0
Deals, Finland, 2nd and 1st. std.		
100 ....load	8 10 0	11 0 0
,, 4th and 3rd ....load	7 0 0	8 0 0
Deals—Riga ....load	7 0 0	9 0 0
St. Petersburg, 1st yellow ....load	11 0 0	14 0 0
,, 2nd ,, ...load	9 0 0	10 10 0
,, white ....load	6 10 0	10 0 0
Swedish ....load	7 10 0	16 0 0
White Sea ....load	9 0 0	17 0 0
Canada, Pine, 1st ....load	16 0 0	26 0 0
,, ,, 2nd ....load	11 0 0	17 10 0
,, ,, 3rd, &c. ....load	8 0 0	10 10 0
,, Spruce, 1st ....load	9 0 0	11 0 0
,, ,, 3rd and 2nd ....load	7 0 0	9 0 0
New Brunswick, &c. ....load	6 0 0	8 10 0
Battens, all kinds ....load	6 0 0	17 0 0
Flooring Boards, sq., 1 in., prepared, First ....sq.	0 11 0	0 14 0
Second ....sq.	0 8 0	0 10 6
Other qualities ....sq.	0 6 0	0 7 9
Cedar, Cuba ....foot	0 0 4	0 0 5
Honduras, &c. ....foot	0 0 4	0 0 4½
Mahogany, Cuba ....foot	0 0 5	0 0 6½
St. Domingo, cargo average ..	0 0 5	0 0 6½
Mexican, cargo average	0 0 4½	0 0 5½
Tobasco ,, ...	0 0 5½	0 0 6½
Honduras ,, ...	0 0 5½	0 0 6½
Box, Turkey ....ton	4 0 0	13 0 0
Rose, Rio ....ton	15 0 0	20 0 0
Bahia ....ton	14 0 0	18 0 0
Satin, St. Domingo ....foot	0 0 9	0 1 3
Porto Rico ....foot	0 0 10	0 1 6
Walnut, Italian ....foot	0 0 4½	0 0 6½
IRON— METALS.		
Bar, Welsh, in London ....ton	0 0 0	0 0 0
,, ,, at works in Wales ....ton	0 0 0	0 0 0
,, Staffordshire, in London ..	8 10 0	9 10 0
COPPER—British, cake and ingot	53 10 0	0 0 0
Best selected ....ton	55 0 0	0 0 0
Sheets, strong ....ton	62 0 0	63 0 0
Chili, bars ....ton	47 5 0	0 0 0
YELLOW METAL ....lb.	0 0 5½	0 0 6

METALS *(continued)*.	£. s. d.	£. s. d.
LEAD—Pig, Spanish ....ton	12 17 6	0 0 0
English, com. brands	12 17 6	13 0 0
Sheet, English	14 15 0	0 0 0
Pipe	15 5 0	0 0 0
TIN—Straits	90 5 0	0 0 0
Australian	90 5 0	0 0 0
English Ingots	95 0 0	0 0 0
OILS.		
Linseed ....ton	22 5 0	22 12 6
Cocoanut, Cochin	26 0 0	26 10 0
Cocoanut, Ceylon	23 10 0	0 0 0
Palm, Lagos	23 10 0	24 0 0
Rapeseed, English pale	34 10 0	0 0 0
,, brown	32 15 0	33 0 0
Cottonseed, refined	22 5 0	0 0 0
Tallow and Oleine	21 0 0	40 0 0
Lubricating, U.S.	5 10 0	6 10 0
,, refined	7 0 0	12 0 0
TAR—Stockholm ....barrel	1 6 0	0 0 0
Archangel	0 17 6	0 0 0

COMPETITION, CONTRACTS & PUBLIC APPOINTMENTS.

Epitome of Advertisements in this Number.

COMPETITION.

Nature of Work.	By whom Required.	Premium.	Designs to be delivered.	Page
Public Baths, &c.	Camberwell Bath Com.	Not stated	Not stated.	ii.

CONTRACTS.

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.	Page.
Works and Materials	Tottenham Local Board	*Official*	Mar. 4th	ii.
Kerbing, Tarpaving, Metalling, &c.	Lewisham Bd. of Works	do.	do.	ii.
Works and Materials	do.	do.	do.	ii.
Slopping and Watering, Dusting, &c.	St Margaret (Westminster) Vestry		do.	ii.
Reflux Valves, Stop Valves, &c.	Manchester Corp.	G. R. W. Wheeler	do.	ii.
Works and Materials	Kingston Highway Bd.	G. H. Hill	Mar. 8th	ii.
Making of Roadways	St. Mary (Islington) Vestry	A. J. Henderson	do.	ii.
Supply of Timber	G. W. R. Co.	*Official*	do.	xii.
Bakehouse, &c.	Barnet Union	do.	Mar. 6th	ii.
Sewerage Works, &c., Loughton	Epping R.S.A.	do.	do.	xii.
Timber [Grain Shed (Peterboro'), and Shedding, &c. (Derby)	M. R. Co.	E. Egan	do.	ii.
Cleaning and Painting Stations, &c.	do.	*Official*	Mar. 7th	xi.
New Works at Parish Church, Ruardean	The Committee	A. A. Langley	do.	xi.
Croydon Gravel for Roads	St. Giles (Camberwell) Vestry	Waller & Son	Mar. 10th	ii.
Works and Materials	St. Giles Bd. of Works	*Official*	do.	xi.
Purchase and Pulling-down Building Mat.	School Bd. for London	do	do.	xi.
Quebec Yellow Pine	G. W. R. Co.	do.	do.	xi.
Underground Urinal	Wandsworth Bd. of Wks	do.	Mar. 11th	xii.
Silicated Concrete Pipes	Norwich Town Council	do.	do.	xi.
Portland Cement	do.	P. P. Marshall	do.	xii.
Compressed Bricks	do.	do.	do.	xii.
Works and Materials	Rotherhithe Vestry	do.	do.	xii.
Road Materials, Royal Parks	Com. of H.M. Works	*Official*	do.	xii.
Works and Materials	Sheffield Highway Com.	do.	Mar. 12th	ii.
Roadmaking and Paving Works	Hammersmith Vestry	C. F. Wike	do.	xi.
Wrought-iron Fencing, &c.	Hastings Union	H. Mair	do.	xii.
Formation of Roads, Surface Drainage, &c.	do.	Philip H. Tree	Mar. 13th	xi.
Repairs of Roads and Footpaths	Metro. Asylums Board	do.	do.	xi.
Enlargement of Post-Office, Birkenhead	Com. of H.M. Works	*Official*	do.	xi.
Works and Materials	Bath U.S.A.	do.	Mar. 14th	ii.
Works, Materials, &c.	do.	C. B. Fortune	Mar. 15th	xi.
Buildings on Pier, Douglas, Isle of Man	Isle of Man Harb. Com.	do.	do.	ii.
Making-up Roads	Berkenham Local Bd.	H. A. Cheers	do.	ii.
Filling-up Grips in Precipitation Channels, &c.	London County Council	G. B. Carlton	Mar. 17th	ii.
Band Stand, Clapham Common	do.	*Official*	do.	xi.
Works and Materials	Bermondsey Vestry	do.	do.	xi.
Stone Paving	Com. of Sewers	do.	do.	xi.
Maintenance and Repairs of Main Roads	County of Kent	do.	Mar. 19th	xi.
Road Materials, Sewer Pipes, &c.	St. Helen's Highway, &c., Committee	F. W. Ruck	do.	xi.
Hospital Buildings, near Bath	The Trustees	G. J. C. Broom	Mar. 19th	xi.
Store Buildings, Wrought-iron Railings, &c. (Kennington)	London County Council	H. Spackman	do.	xii.
Enlargement of Schools, Burton-on-Trent	The Governors	*Official*	Mar. 22nd	xi.
		R. Churchill	Not stated.	xi.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in.	Page.
Assistant Surveyors (5) of Main Roads	Staffs. County Council	175*l.* each	Mar. 8th	xviii.
Book-keeper and Clerk (Surveyors' Dept.) ..	St. George (Hanover-square) Vestry	120*l.*	Mar. 10th	xviii.
Surveyor's Assistant	Wandsworth Bd. of Wks	2*l.* weekly	Mar. 11th	xviii.
Assistant Surveyor	Croydon Corporation	100*l.*	Mar. 17th	xviii.

TENDERS.

[Communications for insertion under this heading must reach us *not later than* 12 *noon on Thursdays.*]

BANBURY.—For the erection and completion of Salvation Army Fortress in Banbury, for General Booth. Mr. J. Williams Dunford, 101, Queen Victoria-street, architect and surveyor:—

Orchard & Son, Banbury	£975 0 0
Haywood & Son, Bedford	963 0 0
Ellwood & Son, Sandy	790 0 0
S. Hipwell, Wisbech	742 0 0
E. Jarvis, Banbury (accepted)	718 0 0

CAMBORNE.—For the erection and completion of Salvation Army Fort in Camborne, for General Booth. J. Williams Dunford, architect and surveyor, 101, Queen Victoria-street, E.C.:—

H. Skewer, Camborne	£980 0 0
J. Julian, Truro	950 0 0
Walmesley & Eunice	929 0 0
Willoughby, Redruth	880 0 0

CHATHAM.—For the erection and completion of Fortress, for General Booth. Mr. J. Williams Dunford, architect, 101, Queen Victoria-street, London, E.C.:—

Skinner, Chatham	£1,175 0 0
Burrows, Maidstone	1,005 0 0
Dupont, Colchester	980 0 0
Martin & Barclay, Battersea	975 0 0
E. Jarvis, Banbury (accepted)	895 0 0

CARDIFF.—For erecting new hotel in Albany-road, Cardiff. Messrs. T. Waring & Son, architects:—John Hopkins, Roath, Cardiff* £3,500 0 0

* Accepted.

CHISWICK.—For erecting a house and stables at Sutton Court Park, Chiswick, for Mr. J. Woodger. Messrs. Wylson & Long, architects:—

W. & F. Wright	£4,370 0 0
T. L. Green	3,869 0 0
H. & E. Lee	3,815 0 0
Patman & Fotheringham	3,798 0 0
Newcomb	3,746 0 0
C. F. Kearley	3,696 0 0
J. T. Chappell	3,678 0 0
T. Nye	3,661 0 0
Saunders	3,585 0 0
S. Hunt	3,559 0 0
Leslie & Co.	3,537 0 0
Oldrey & Co.	3,489 0 0
Adamson & Son	3,477 0 0

CHISWICK.—For repairs, alterations, and additions to the church of St. Mary Magdalene, Chiswick. Messrs. Newman & Newman, architects, 31, Tooley-street, London Bridge. Quantities by Mr. G. Fleetwood:—

	Church.	Schools &c.
L. H. & R. Roberts	£4,403	£55
Balaam Bros.	4,008	174
Goddard & Sons	3,826	101
J. Hunt	3,807	108
Chamberlen Bros.	3,745	60
Adamson & Sons	3,579	270
J. Dorey	3,180	—

[These Tenders include an allowance for old materials.

COVENTRY.—For the erection of school and class rooms and additions, &c., to the Wesley Chapel, Warwick-lane, Coventry. Mr. Herbert W. Chattaway, architect, Trinity-churchyard, Coventry :—

G. Haywood, Gosford-street, Coventry	£2,859 0 0
G. Gray Hill, Much Park-street, Coventry	2,828 0 0
T. & S. Herbert, Welford-road, Leicester	2,746 10 0
C. Garlick, Far Gosford-street, Coventry (accepted)	2,704 0 0
Heatherley Bros., Gosford-street, Coventry	2,623 0 0

DARLINGTON.—For erecting and finishing boys' school to accommodate 390 pupils, for the Darlington School Board. Mr. Thos. W. Robson, architect, 10, Paradise-terrace, Darlington. Quantities by Mr. H. T. Nelson, Darlington :—

Brick, Stone, and Plasterers' Work, including Cement Flooring.	
George Marshall	£1,917 7 10
Slaters' Work.	
J. & G. Wharton	166 1 3
Plumbing, Glazing, and Gasfitting.	
Emmerson Smith	333 0 0
Painters' Work.	
W. H. & W. Hoskins	37 19 0

[All of Darlington.]

EAST WICKHAM (Kent).—For alterations and additions to the "Forester" public-house, Wickham-lane, for Messrs. Mitchell & Beasley, of the North Kent Brewery. Mr. J. O. Cook, architect, Eleanor-road, Woolwich :—

Bottley, Old Kent-road	£591 0 0
Foreman, Plumstead	515 0 0
J. O. Richardson, Peckham (accepted)	449 0 0

ELTHAM (Kent).—For completion of boundary-walls and fences at Avery Hill House, for Colonel J. T. North. Messrs. J. O. Cook and T. W. Cutler, joint architects :—

Smith & Sons, Norwood	£815 0 0
J. T. Chappell, London (accepted)	739 0 0

ESTON MINES.—For the erection and completion of Salvation Army Fort, for General Booth. Mr. J. W. Dunford, architect and surveyor, 101, Queen Victoria-street, E.C. :—

Oliver & Gandion	£695 10 0
T. Bulner, South Bank	509 7 0
G. Radge, Normanby	499 5 0
J. Welsh, Stockton-on-Tees *	365 0 0
J. Lord, Middlesbro'	354 10 0

* Accepted.

GOREY (Channel Islands).—For the erection of a Salvation Army Fort, for General Booth. Mr. J. Williams Dunford, architect and surveyor, 101, Queen Victoria-street, E.C. :—

P. Le Rossignol & Son, Rouge Bouillon	£458 17 0
Springate & Baker, Gorey	394 0 0
Laurens & Le Corum & Son, St. Heliers	385 0 0
A. Viel, Jersey	369 0 0
E. J. Laurens, St. Heliers	362 10 0

GUILDFORD.—For the erection of St. John's Ecclesiastical Seminary, Lostiford, near Guildford, Surrey, for the R.C. Bishop of Southwark. Mr. F. A. Walters, architect, 4 Great Queen-street, Westminster. Quantities by Mr. John B. Lofting, 6, Great Queen-street, Westminster :—

	Seminary.	Carriage drive.
Patman & Fotheringham, London	£27,336	£890
Coles & Son, London	27,200	525
Simpson & Co., London	27,130	820
Marriage, Croydon	26,500	540
Silver & Sons, Maidenhead	26,010	599
Sanders, Southampton	25,990	513
Gregory & Co.	25,777	535
Harris & Wardrop	25,622	556
Parnell & Son, Rugby	25,497	486
Higgs & Hill	24,990	650
Smith & Son, Croydon	24,767	625
Bottrill & Son, Reading	24,195	765
Longley, Crawley	22,665	375

HERNE BAY (Kent).—For the erection of new premises, William-street, for Mr. Moore, grocer. Mr. H. Farley, architect, Richmond-street, Herne Bay :—

C. Welby	£1,520 0 0
E. Taylor	1,363 0 0
G. Admans	1,358 0 0
G. Farley	1,350 0 0
A. J. Ingleton (accepted)	1,347 0 0

[All of Herne Bay.]

IDLE (Yorks).—For the erection and completion of Salvation Army Fortress in Idle, for General Booth. Mr. J. Williams Dunford, architect, 101, Queen Victoria-street, London, E.C. :—

T. & A. Thornton, Bromley	£792 0 0
Robson & Son, Idle	783 0 0
Padgett, Idle	750 0 0
T. Obank & Sons, Thackley *	721 0 0

* Accepted.

JOHANNESBURG (South Africa).—For supplying walnut chimneypieces, &c., for the Stock Exchange, Johannesburg :—

C. Hindley & Sons (accepted)	£196 10 0

LA RUETTE (Channel Islands).—For the erection and completion of Salvation Army Fortress, for General Booth. Mr. J. Williams Dunford, architect, 101, Queen Victoria-street, London, E.C. :—

Mangor & Prianlx (accepted)	£470 0 0

LONDON.—For the erection of a Cookery Centre, laboratory, and drawing-class room, on the Medburn-street site, St. Pancras, for the School Board for London. Mr. T. J. Bailey, architect :—

		If brickwork is built in cement.
J. M. Macey & Sons	£2,330	£2,190
Killby & Gayford	2,323	2,368
W. Cubitt & Co.	2,305	2,360
Dove Bros.	2,280	2,345
Patman & Fotheringham	2,173	2,223
E. Lawrance & Sons	2,091	2,128
W. Goodman*	2,078	2,128

* Recommended by the Works Committee for acceptance.

LONDON.—For the erection of eight studios, West Kensington, W. Mr. Frederick Wheeler, architect, 22, Chancery-lane. Quantities by Messrs. Evans & Deacon, 1, Adelaide-street, Charing-cross, S.W. :—

		Extra if in Terra-cotta.
Hills Bros.	£10,400	£250
Lagg	10,200	105
Candler & Son	10,150	200
Shillitto, Bury St. Edmunds	10,100	175
Bywater	9,785	196
Peters, Horsham	9,380	158
Foster & Dicksee, Rugby	9,323	200
G. Jervis Smith	8,687	164

LONDON.—For erecting new printing warehouse in Southwark-street, S.E., for the Committee of Lloyd's Registry. Mr. W. Hilton Nash, architect, 5, Adelaide-place, E.C. Quantities by R. Fabian Russell, 6, Moorgate-street, E.C. :—

Leeks & Hooker	£7,000 0 0
Colls & Sons	6,777 0 0
T. Rider & Son	6,738 0 0
Patman & Co.	6,663 0 0
Higgs & Hill	6,590 0 0
D. Charteris (accepted)	6,520 0 0

LONDON.—For building five shops, Goldhawk-road, Shepherd's Bush, for Mr. Edward Roberts. Mr. W. G. Bartleet, architect, 2, New Broad-street, E.C. :—

Cragg	£5,080 0 0
Kirk and Randall	3,274 0 0
Patman & Fotheringham	3,243 0 0
Leslie & Co.	3 229 0 0
Oldrey & Co.	2,997 0 0
Lundy	2,015 0 0

LONDON.—For additions and alterations to "Baron's Court Hotel," West Kensington, for Mr. H. Miller. Messrs. Wylson & Long, architects, 15, King William-street, Strand :—

T. L. Green	£1,637 0 0
Faulkner, Jun.	1,590 0 0
Patman & Fotheringham	1,563 0 0
Mark Patrick & Son	1,483 0 0
C. F. Kearley	1,430 18 0
J. T. Chappell	1,419 0 0
Oldrey & Co.	1,325 0 0

LONDON.—For certain alterations and additions to No. 225, Upper-street, Islington, N., for Mr. T. R. Roberts. Mr. J. Kingwell Cole, architect. Quantities by Mr. E. S. Mansergh, 28, Mount-street, Grosvenor-square, W. :—

Patman & Fotheringham	£2,150 0 0
B. E. Nightingale	1,990 0 0
Drew & Cadman	1,882 0 0
G. S. S. Williams & Son	1,816 0 0
Dove Bros.	1,645 0 0
J. Mowlem & Co.	1,594 0 0
G. Neal	1,546 0 6
Puzey & Lumley	1,525 0 0
Wall Bros. (accepted)	1,494 0 0

LONDON.—For the erection of the first portion of St. George's Church, Westcombe Park, Blackheath, for the Rev. W. H. K. Soames. Messrs. Newman & Newman, architects, 31, Tooley-street, London Bridge :—

Balsam Bros. (accepted)	£5,172 0 0

[No competition.]

LONDON.—For pulling down and rebuilding 30, 31, and 32, Sandy's-row, Whitechapel, E., for Mr. J. Gabriel. Mr. J. O. Cook, architect, Eleanor-road :—

Harris, North Woolwich	£887 0 0
Battley, Old Kent-road	870 0 0
Sharpe, Bow	715 0 0
J. O. Richardson, Peckham (accepted)	714 0 0

LONDON.—For the erection of a steward's house at the Infirmary, Rackham-street, Notting-hill, for the Guardians of the Poor of the Parish of St. Marylebone. Messrs. H. Saxon Snell & Son, architects, London :—

H. B. Oldney	£1,370 0 0
G. Gaisford	1,293 0 0
Patman & Fotheringham	1,229 0 0
Wall Bros.	1,225 0 0
Thos. E. Mitchell	1,184 0 0
G. Godson & Sons	1,174 0 0
Thomas Nye, Ealing (accepted)	1,138 0 0

LONDON. — For first portion of alterations and repairs at No. 2, Hanover-square, for Mdlles. Michard Sœurs, under the direction of Messrs. Morley & Letts, surveyors, 185, Earl's Court-road :—

Henry Smith & Sons	£339 0 0
R. Elwin	325 0 0
James Whitaker, Earl's Court-road *	297 0 0

* Accepted.

Electric Lighting (wiring only).

Whitaker (accepted)	£2 10 0

LONDON.—For sinking and building new brick pits, &c., at Horney-lane, Bermondsey, for Messrs. E. Ellis & County :—

Wells, Bermondsey	£143 0 0
S. Ellis, Guildford	127 0 0

LONDON.—For decorations, repairs, and alterations at 2, Orme-square, Bayswater, W. Mr. F. W. Kinneir Tarte, architect and surveyor :—

F. Giles & Co., Kensington	£760 0 0
Johnson & Manners, Great Fulteney-street, W.	684 0 0
Vernall & Griffiths, Albany-st., W.	670 0 0
Wells & Son, Red Lion-street, W.C.*	534 0 0
Drainage Work.	
R. P. Beattie	161 0 0
W. Dodds	159 0 0
Wells & Son (accepted)	134 0 0
Heating.	
J. Keith, Holborn Viaduct (accepted)	145 0 0

* Accepted.

LONDON.—For decorations, repairs, and alterations at the "Midland Hotel," Luton, for Messrs. Bingham-Cox & Co. Mr. F. W. Kinneir Tarte, architect and surveyor :—

W. & A. Cox, Luton	£422 10 0
W. Sparrow, Harpenden	409 10 0
W. G. Dunham, Luton (accepted)	405 0 0

LONDON.—For pulling down the present water-closets and urinals, and erecting new ones with cast-iron enclosure, in Southwark Park, for the London County Council. Mr. T. Blashill, architect :—

T. Channing	£134 0 0
A. & W. Garnar	133 0 0
Smith & Co.	130 0 0

LONDON.—For alterations and additions to the "Ifield Tavern," Ifield-road, Fulham, S.W. Mr. G. Treacher, architect, 30, Coleman-street, E.C. :—

H. Smith & Son	£435 0 0
Walker Bros.	430 0 0
J. Mills	410 0 0
Moore & Son	359 0 0
Alfew & Richardson	348 0 0
Gregar	345 0 0
Dorman	293 0 0
Washington (accepted)	287 0 0

LONDON.—For the erection of refreshment-room and outbuildings in Ravenscourt Park, Hammersmith, for the London County Council. No quantities :—

F. Blandford & Co., 59, Queen's-road, Walworth	£1,900 0 0
J. Boarder, 2 and 4, Hetley-road, Uxbridge-road, W.	1,075 0 0
H. G. Heywood, 44, Bridge-road, Hammersmith	885 0 0
A. Adams & Son, 240, King-street, West Hammersmith	798 0 0
Simmonds Bros., 12, College-street, Chelsea	797 0 0
Lapthorne & Co., 1 and 2, High-street, Lambeth	738 0 0
J. Martin, 3 and 7A, Warwick-place, Malda-hill	648 0 0

LONDON.—For pewterers' work to the "Cock" Tavern, Denmark Hill, for Messrs. Ayres & Co. Mr. H. I. Newton, architect, 49, Victoria-street, Westminster, S.W. :—

F. Mathews, Walworth-road*	£129 0 0

* Accepted.

LONDON.—For proposed alterations to the International Head-quarters of the Salvation Army, 101, Queen Victoria-street, E.C., for General Booth. Mr. J. Williams Dunford, architect and surveyor, 101, Queen Victoria-street, E.C. :—

	Pitch Pine.	Yellow Pine.
C. Robson, Lewisham	£479	—
Coxhead, Leytonstone	468	£418
Martin & Barclay, Battersea	440	380

LONDON.—For alterations to premises, Horseferry-road, Westminster, for General Booth. Mr. J. Williams Dunford, architect and surveyor, 101, Queen Victoria-street, E.C. :—

Robson, Lewisham	£1,150 0 0
Coxhead, Leytonstone	963 0 0
Martin & Barclay, Battersea*	889 0 0

* Accepted.

LONDON.—For fitting up the premises known as the "Oriental Restaurant," Blackfriars Bridge, as offices, for General Booth (branch offices of the International Headquarters). Mr. J. Williams Dunford, architect, 101, Queen Victoria-street, London, E.C. :—

F. J. Coxhead, Leytonstone	£1,711 0 0
A. Martin, Battersea	1,626 0 0
W. & H. Castle, Southwark	1,546 0 0

LYMINGTON.—For the erection and completion of Fortress, for General Booth. Mr. J. Williams Dunford, architect, 101, Queen Victoria-street, London, E.C. :—

G. Coles, Lymington	£599 0 0
J. Denham, Norton Green	535 0 0
A. Wheeler, Lymington	508 0 0
E. G. Perkins, Lymington	487 19 0
Martin & Barclay, Battersea	473 0 0
E. Jarvis, Banbury (accepted)	430 0 0

MIDHURST (Sussex).—For erecting house at Pendean Farm, near Midhurst, Sussex, for Mr. G. H. Drew. Mr. John Oldrid Scott, architect, 31, Spring-gardens, S.W. Quantities by Messrs. John S. Lee & Sons :—

	House.	Verandah.
Dove Bros.	£4,595 0 0	£175 0 0
Thomson, Peterborough	4,676 0 0	126 0 0
Anscombe	4,594 0 0	135 10 0
Dobson	4,480 0 0	140 0 0
S. Norman	4,460 0 0	135 0 0
C. Longley, Crawley	4,395 0 0	145 0 0
Bottrill & Son, Reading	4,395 0 0	130 0 0
Gregory & Co.	4,287 0 0	145 0 0
W. Pledge	4,197 0 0	131 0 0
R. Fink, Milford	4,153 0 0	112 0 0
Pattison	4,100 0 0	131 0 0
P. Peters, Horsham	3,927 0 0	124 18 0
G. Box	3,918 0 0	114 0 0

MACCLESFIELD.—For alterations and additions to the Theatre Royal, Mill-street, Macclesfield, for General Booth. Mr. J. Williams Dunford, architect and surveyor, 101, Queen Victoria-street, E.C. :—

G. Roylance, Macclesfield	£1,150 0 0
W. W. Gladwell, Macclesfield	1,000 0 0
Weale & Co., Ludlow	900 0 0
Martin & Barclay, Battersea*	817 0 0

* Accepted.

NEWCASTLE-ON-TYNE.—For the erection and completion of Citadel, accommodating 3,000 persons, for General Booth, in Westgate-road, Newcastle-on-Tyne. Mr. J. Williams Dunford, 101, Queen Victoria-street, London, E.C. :—

Lowry, Newcastle	£3,657 0 0
Coxhead, Leytonstone	3,397 0 0
Middlemiss Bros., Newcastle*	3,125 0 0

* Accepted.

POTTON.—For the erection and completion of Salvation Army Fort in Potton, for General Booth. Mr J. Williams Dunford, architect and surveyor, 101, Queen Victoria-street, E.C. :—

J. Smith, Bedford	£472 0 0
Haywood & Son, Bedford	385 0 0
H. Walker, Bedford	319 0 0
J. Ramsford, Potton	286 10 0
S. Woodman, Potton	285 0 0
Ellwood & Son, Sandy	235 0 0
E. Jarvis, Banbury (accepted)	228 0 0

PRESTON (Lancs.).—For pulling down and rebuilding Mission-room, Ragged School, &c., Leeming-street, Preston, for Rev. E. Over. Mr. Thomas W. Weaver, architect, Preston :—

George Lucas (accepted)	£408 0 0

PRESTON (Lancs.).—For pulling down and rebuilding "The Goulbourn Inn," Porter-street, Preston, for Messrs. Beardsworth & Whalley, Little Harwood Brewery, Blackburn. Mr. Thomas W. Weaver, architect, Preston. Quantities supplied by the architect :—

John Walmsley	£1,420 0 0
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J. Jarvis, Grove Hill-road*	195 0 0
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[All of Tunbridge Wells.]

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